

Inventory and Assessment of Upland Vegetation on the Pioneer Mountain Ranch

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EXECUTIVE SUMMARY

The Pioneer Mountain Ranch lies in the southeastern portion of the Pioneer Mountains of east-central Idaho. Located at the interface of montane woodland and sagebrush steppe ecosystems, the area encompasses key wildlife habitats and high biological diversity. A comprehensive inventory and assessment of the biological components of the area will provide baseline information for the maintenance and enhancement of high quality biological values within the area.

The objectives of the study are to: (1) prepare a high resolution, comprehensive vegetation map for the study area at the scale of 1:24,000; (2) provide documentation of the composition and structure of major vegetative cover types; (3) conduct rare plant inventories; (4) identify unique, rare, or outstanding exemplary stands of vegetation; (5) estimate wildlife use of the area; and (6) provide recommendations for management and monitoring within the three units of the Pioneer Mountain Ranch.

The study encompasses relatively steep, highly dissected foothill slopes and relatively broad, gentle valley bottoms. Elevation ranges from 5,151 to 9,233 feet. The climate is characterized by relatively warm summers and cold winters. Approximate mean maximum and minimum temperatures are, respectively, 55° and 27° F. Mean annual precipitation ranges from approximately 15 inches in valley bottoms to 25 inches on upper slopes and ridge crests of the northern portions of the study area. The predominant rock within the study area is Mississippian thrust limestone of the Wood River Formation.

A geographical information system (GIS) database for five vegetation attributes: cover type, potential natural vegetation, seral status, structural condition, and ecological condition was developed to fully describe upland vegetation within the Pioneer Mountain Ranch study area. Stand level point observation and ecology plot data were used to describe the distribution, composition, and structure of the vegetation. Pellet groups of wild and domestic ungulates and grouse were tallied by species. An initial rapid assessment of rare plant species populations and habitats within and adjacent the study area identified seven rare plant species as possibly occurring within the study area. Rare plant searches were conducted for, though not restricted solely to, these species and their habitats.

Forty-nine plant associations were observed on 482 plots located in the upland environments of Pioneer Mountain Ranch. The extent of each plant association, current vegetative cover, and the ecological and structural condition of stands within the study area is shown in a series of maps and summarized in tabular form. The upland vegetation on Pioneer Mountain Ranch is primarily mid- to late-seral and in good to excellent ecological condition (B- and A-ranked). The ranch encompasses some of the highest quality, representative stands known within the region (Idaho Conservation Data Center 2003b). The effects of resource-based land use practices and chronic disturbances, such as exotic species invasion and their cumulative effects, however, have taken a toll. As with many sagebrush steppe ecosystems of the Great Basin, Snake River Plain, and the Upper Columbia Basin, portions of the vegetation are at risk - perched on a threshold of permanent change and loss of ecological values observed today.

Discussion of the vegetation observed on Pioneer Mountain Ranch is arranged by physiognomic group (Federal Geographic Data Committee-Vegetation Subcommittee 1996), series, and plant association. The distribution and composition of each plant association is summarized. Conservation and management considerations are summarized at the hierarchical level (e.g., association versus series) necessary to provide sufficient detail without extensive repetition. A list of plant species observed on Pioneer Mountain Ranch is provided.

Evergreen forest and woodland vegetation on the Pioneer Mountain Ranch consists of stands dominated by *Pseudotsuga menziesii*, *Pinus flexilis*, and *Abies lasiocarpa*. Eleven coniferous forest associations observed within the study area are represented within four mapping units. *Pseudotsuga menziesii* plant

associations are most prominent within forested areas of the study area. Forest stands on mid- and upper-slope positions are mid- and late-seral old growth. The majority of stands sampled are A- and AB-ranked. Poorer conditions generally occur on lower slope positions. These stands were historically selective harvested and currently receive heavy use by sheep. Recent partial cut harvest activity on the eastern tributaries of upper Fish Creek has resulted in the establishment of numerous populations of *Centaurea diffusa* and *Centaurea maculosa*. Eradication of these populations and control of these species in *Pseudotsuga menziesii* forest communities should be given high management priority.

Seven *Populus tremuloides* deciduous forest and woodland plant associations observed on the upland portions of the Pioneer Mountain Ranch study area are represented within three mapping units. *Populus tremuloides* stands are popular among many of the seasonal and year-round ungulate residents of the Pioneer Mountain Ranch area. Many stands are in a degraded ecological condition (BC- to CD-ranked). A- and AB-ranked stands are rare. Nearly all the stands visited are grazed by livestock. Mid- and upper-slope stands are often trailed and terraced due to livestock traffic. Lower-slope stands adjacent water supplies are heavily used by livestock for grazing and loafing. Severe impacts of livestock grazing and trampling resulting in heavily churned, bare soil are localized to extensive in portions of the study area. Management of aspen within the study area should prioritize restoration or maintenance of understory native perennial grass, forb, and shrub cover. This will be accomplished most effectively through a dramatic reduction in livestock utilization of these stands.

Evergreen shrubland and evergreen dwarf-shrubland are the most abundant vegetation on Pioneer Mountain Ranch. *Artemisia tridentata vaseyana* shrublands occur over more than 50 percent of the study area. The majority of the evergreen shrubland and evergreen dwarf-shrubland vegetation is in high quality condition. Higher management concerns regard stands on lower-slope positions and south-facing slopes. These stands are most heavily used by livestock or most prone to invasion by exotic annual grass species. There is no apparent need for use of prescribed fire in *Artemisia tridentata vaseyana* stands within the study area at this time. Rather, management within these stands should prioritize re-establishment of native perennial species on lower-slope positions and valley bottoms and prevention of further decline in the abundance of native perennial bunchgrass species due to wildfire and livestock use.

Pioneer Mountain Ranch encompasses extensive areas of high quality vegetation. In particular, stands located on steep, mid- and upper-slope positions are largely in a high quality, representative condition. Numerous unique, outstanding exemplary plant community element occurrences are present within the study area. The Pioneer Mountain Ranch presents significant opportunity to conserve components of biological diversity. Stands of *Pinus flexilis/Festuca idahoensis*, *Pseudotsuga menziesii/Calamagrostis rubescens*, and *Pseudotsuga menziesii/Festuca idahoensis* within the Biskay management unit are outstanding and highly significant occurrences based on their large size, excellent ecological condition, and relative protected setting. No reference stands are currently within a formally established conservation site within the region.

A number of *Artemisia tridentata vaseyana* and *Artemisia arbuscula* plant associations are poorly represented within the statewide network of natural areas and ecological reference areas. Stands of the following plant associations within the study area present highly significance conservation opportunity due to their large size and high quality, representative condition: *Artemisia tridentata vaseyana-Symphoricarpos oreophilus/Agropyron spicatum*, *Artemisia tridentata vaseyana-Symphoricarpos oreophilus/Festuca idahoensis*, *Artemisia tridentata vaseyana/Agropyron spicatum*, *Artemisia arbuscula/Agropyron spicatum*, and *Artemisia arbuscula/Festuca idahoensis*. There are no known stands of these associations that are formally recognized to serve as long-term ecological references for these major components of the vegetation within the Challis Volcanics ecoregional section.

Populations of four rare plant species occur on sites adjacent the Pioneer Mountain Ranch study area: *Allium anceps*, *Antennaria arcuata*, *Haplopappus insecticruris*, and *Phacelia inconspicua* (Idaho Conservation Data Center 2003a). A new population of *Haplopappus insecticruris* was located in the upper Fish Creek drainage. *Haplopappus insecticruris* is considered rare and uncommon globally and

statewide but is not considered to be imperiled. The species is locally endemic to Camas and Blaine counties. Excellent habitat for *Phacelia inconspicua* was observed on the southeastern slopes of the central Pioneer Mountain ridgeline. *Phacelia inconspicua* is considered imperiled globally and critically imperiled statewide. The species is a regional endemic with very few known populations. The 0.5-2 dm tall annual herb with congested clusters of small pale blue or whitish flowers is known from seven populations rangewide.

Pioneer Mountain Ranch encompasses extensive areas of high quality vegetation. Important components of the vegetation have been degraded and are susceptible to further degradation based on the seasonal timing and intensity of fire disturbance and livestock use. Conservation management strategies need to focus on (1) significant reduction of the number of livestock, and the seasons of livestock use, within the area; (2) wildfire prevention; (3) direct mitigation and restoration of degraded habitats; and (4) a monitoring and evaluation system.

Livestock (cattle and sheep) use is the principle ecological mechanism to begin downward trends in vegetative condition and the quality of habitats present on Pioneer Mountain Ranch. The number and season of livestock use within the study area must be reduced from customary levels in order to simultaneously maintain existing high quality habitat conditions while also restoring those habitats that are degraded.

Native perennial bunchgrass species, *Elymus cinereus*, *Festuca idahoensis*, *Poa secunda*, and *Agropyron spicatum*, are key components of the shrubland ecosystems of the Pioneer Mountain Ranch. These species provide both important ecological and commercial resource values. The long-lived, deep-rooted perennial bunchgrass species native to the area also serve a keystone role in the maintenance of ecosystem stability and resilience to disturbance events and environmental change. Loss of the abundance and vigor of bunchgrass triggers the raveling (perhaps eventually irreversible) decay of ecosystem integrity, and the capability of these sites to produce wildlife habitat and commercial resource values. In order to maintain and enhance ecosystem quality and commercial resource values, management must result in significant and prolonged gains in the distribution and abundance of bunchgrass.

Adaptive management is an approach that involves the ordered steps of planning, implementing, monitoring, and evaluating. In this cyclical approach monitoring and evaluation are key links to the achievement of management objectives. A monitoring system should be established within the study area that allows the referential power, for example, of paired sampling designs. The capability to identify critical causal relationships between patterns in resource utilization and vegetation composition and structure, the quality of wildlife habitats, and the maintenance of biological diversity will require access to strictly controlled reference conditions. A well planned system of fenced livestock exclosures of sufficient number and size to represent long-term reference ecological conditions of the major plant associations on Pioneer Mountain Ranch should be identified and constructed.

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Introduction

The Pioneer Mountain Ranch lies in the southeastern portion of the Pioneer Mountains of east-central Idaho. Vegetation within the area is diverse. Major cover types include *Artemisia arbuscula* and *Artemisia tridentata vaseyana* shrubland; deciduous riparian shrubland; *Populus tremuloides*, *Pseudotsuga menziesii*, and *Abies lasiocarpa* forest. Located at the interface of montane woodland and sagebrush steppe ecosystems, the area encompasses key wildlife habitats and high biological diversity. A comprehensive inventory and assessment of the biological components of the area will provide baseline information for the maintenance and enhancement of high quality biological values within the area.

The objectives of the study are to: (1) prepare a high resolution, comprehensive vegetation map for the study area at the scale of 1:24,000; (2) provide documentation of the composition and structure of major vegetative cover types; (3) conduct rare plant inventories; (4) identify unique, rare, or outstanding exemplary stands of vegetation; (5) estimate wildlife use of the area; and (6) provide recommendations for management and monitoring within the three units of the Pioneer Mountain Ranch.

Study Area

Pioneer Mountain Ranch is located on the southern end of the Pioneer Mountains Range, in east-central Idaho. High elevation, deeply dissected mountainous terrain occurs to the north. In the south are the extensive lava fields of the Great Rift and the gentle, undulating terrain of the Snake River Plain (Figure 1). The study encompasses relatively steep, highly dissected foothill slopes and relatively broad, gentle valley bottoms. Elevation ranges from 5,151 feet (at Lava Lake) to 9,233 (at the summit of Blizzard Mountain).

The 59,970-acre Pioneer Mountain Ranch study area consists of three historic ranch units: Lava Lake, Biskay, and Muldoon. The Lava Lake and Biskay units encompass the southern foothills of the Pioneer Mountains and form the headwaters of Cottonwood Creek, Barn Canyon, Copper Creek, and Fish Creek. The Muldoon unit occurs within the Muldoon Creek drainage, west of the Biskay unit and northwest of the Lava Lake unit (Figure 1).

The study area is located on the Craters of the Moon and Arco BLM Surface Area Management 1:100,000 scale maps. The following 1:24,000 scale USGS topographical maps provide coverage of the study area: Muldoon, Trail Creek, Blizzard Mtn. North, Fish Creek Reservoir, Blizzard Mtn. South, and Inferno Cone. The site is accessed via improved gravel road from Carey or Bellevue, Idaho, or directly off US Route 20.

Climate: The Pioneer Mountain Ranch lies within a zone of transition from Pacific maritime to continental climatic regimes (dominant to the west and east, respectively). Climatic data for four weather stations within in the vicinity of the study area are summarized in Figure 2. The climate is characterized by relatively warm summers and cold winters. Approximate mean maximum and minimum temperatures are 55° and 27° F, respectively. Precipitation is relatively evenly distributed between winter and summer. The greatest precipitation occurs in December and January. A distinctive peak in precipitation also occurs in late spring-early summer peak in mid-May to mid-June. Mean annual precipitation ranges from approximately 15 inches in valley bottoms to 25 inches on upper slopes and ridge crests of the northern portions of the study area.

Geology: The study area encompasses a diverse assemblage of geologic formations, which tell a history of uplifted oceanic crust, volcanic eruptions, plutonic uplifting, stream and glacial weathering processes, and basalt flows (Bond and Wood 1978; Rember and Bennett 1979). The predominant rock within the study area is Mississippian thrust limestone of the Wood River Formation. These rocks occur over (approximately) 60 percent of the study area, forming the slopes and ridges of the southern-most

extension of the Pioneer Mountains, within the Iron Mine Creek, Lake Creek, East Fork Fish Creek, Copper Creek, and Barn Canyon drainages. Eocene extrusive igneous rock of the Challis Volcanics occur in upper Fish Creek and within the Long, Walton, and Riley canyons. These rocks are prominent in the Thompson Creek drainage. Other bedrock formations are (1) Eocene granite located in Cottonwood Creek and (2) recent relatively unweathered Snake River basalt flows located on the south and southeast perimeter (the Grassy and Carey flows, respectively) of the study area (Kuntz et al. 1988). Quaternary colluvial and alluvial surficial deposits are prominent in the broad valley bottoms of Muldoon Creek and Copper Creek. The study area was not prominently glaciated during the Quaternary period, though a small, isolated alpine glacier may have occurred on Blizzard Mountain, in the headwater of Iron Mine Creek (Evenson et al. 1982).

Methods

Vegetative components of terrestrial ecosystems are characterized on the basis of the dominant species cover, seral status, structural condition, and potential natural vegetation. In mapping vegetation, information regarding these four vegetative attributes is mutually supportive. That is, knowledge of one component will assist in the development and refinement of knowledge of the other components.

GIS Methods: A geographical information system (GIS) database for five vegetation attributes: cover type, potential natural vegetation, seral status, structural condition, and ecological condition was developed to fully describe upland vegetation within the Pioneer Mountain Ranch study area. In this spatial database cover type and potential natural vegetation are primary database attributes. Seral status, structural condition, and ecological condition (Table 1) are secondary attributes and serve to qualify, or further define, the primary attributes.

Landsat Thematic Mapper (TM) imagery was used to derive a cover type classification of the study area. Aerial photography and orthophoto quad maps were employed in the interpretation of the Landsat imagery. Potential natural vegetation was modeled using values for slope, aspect, elevation, and topographic configuration calculated from the USGS digital elevation model (DEM); soils; and precipitation (Anderson et al. 1998; Henderson 1998; Daly et al. 1998). Seral status, structural condition, and ecological condition were determined as well through inspection of cover type and potential natural vegetation. To the extent possible, seral status and ecological condition were modeled using information on disturbance and land-use history.

The vegetation mapping project was conducted at the 1:24,000 scale. A 30 X 30 meter pixel size was maintained throughout the project.

Field and Office Methods: Stand level point observation and ecology plot data were used to describe the distribution, composition, and structure of the vegetation. Stand level point observation data were collected primarily to assist in the accumulation of a large number of geographic reference points where knowledge of the vegetation is linked to base information available to assist with mapping the vegetation (e.g., simple environmental data such as elevation and slope aspect and gradient). Ecological point data were collected using the protocol developed by Rust and Moseley (1999). This method is similar to the polygon sampling methods described by USDA Forest Service (1992). Seral, structural, and condition classes used in the study are listed in Table 1. The data card and data dictionary for the stand level observation method are reproduced in Appendix 1 with a brief explanation of the protocol.

Composition and structure data were collected on 0.1 acre fixed-area ecology plots using standard plant community ecology methods (Bourgeron et al. 1991; USDA Forest Service 1992). Plots were located to represent the range in composition and structure of major vegetation mapping units. Data on relatively few plots were collected in comparison to the number of stand level point observations. The locations of stand level point observation and ecology plots were recorded in the field using navigation grade

geographical positioning system (GPS) units (the Garmin 12XL) and by hand on 1:24,000 USGS quadrangles.

Pellet groups of wild and domestic ungulates and grouse were tallied by species on 6 foot by 100 pace (approximately 600 ft.) belt transects within each stand documented by a stand level point observation plot. On the fixed area composition plots, pellet groups observed on the 0.1 acre plot were tallied by species.

Rare Plant Inventories: A rapid assessment of rare plant species populations and habitats within and adjacent the study area was completed prior to conducting extensive field reconnaissance work (Idaho Conservation Data Center 2003a). Based on this pre-field review, the following species were identified as possibly occurring within the study area: *Allium anceps*, *Antennaria arcuata*, *Astragalus atratus insepitus*, *Astragalus onciformis*, *Haplopappus insecticruris*, *Phacelia inconspicua*, and *Stylocline filaginea*. Rare plant searches were not, however, restricted solely to these species and their habitats. Populations of *Astragalus atratus insepitus*, *Astragalus onciformis*, *Haplopappus insecticruris*, and *Stylocline filaginea* near the study area were visited to review species occurrence and habitat characteristics prior to conducting field work in the Pioneer Mountain Ranch study area.

Inventory of Biotic Components

VEGETATION

Forty-nine plant associations were observed on 482 plots located in the upland environments of Pioneer Mountain Ranch (Figure 3). These plant associations are listed in Table 2. The extent of each plant association, current vegetative cover, and the ecological and structural condition of stands within the study area is shown in Figure 4 - 6 and summarized in Table 3. The vegetation on Pioneer Mountain Ranch is primarily mid- to late-seral and in good to excellent ecological condition (B- and A-ranked). Pioneer Mountain Ranch encompasses some of the highest quality, representative stands known within the region (Idaho Conservation Data Center 2003b). The effects of resource-based land use practices and chronic disturbances, such as exotic species invasion and their cumulative effects, however, have taken a toll. As with many sagebrush steppe ecosystems of the Great Basin, Snake River Plain, and the Upper Columbia Basin, portions of the vegetation are at risk -- perched on a threshold of permanent change and loss of ecological values observed today.

Discussion of the vegetation observed on Pioneer Mountain Ranch is arranged by physiognomic group (Federal Geographic Data Committee-Vegetation Subcommittee 1996), series, and plant association. The distribution and composition of each plant association is summarized. Conservation and management considerations are summarized at the hierarchical level (e.g., association versus series) necessary to provide sufficient detail without extensive repetition. At times it is convenient to use codes rather than the lengthy names of some plant associations. The codes for the plant associations observed within Pioneer Mountain Ranch study area are listed in Table 2. A list of plant species observed on Pioneer Mountain Ranch is provided in Appendix 2. Nomenclature throughout the report follows Cronquist et al. (1972 - 1997). The nomenclature for species that are not described by Cronquist et al. (1972 - 1997) follows Hitchcock and Cronquist (1973). The subspecies of *Artemisia arbuscula* are recognized as treated by Winward (1980). For convenience *Artemisia arbuscula* ssp. *arbuscula* is referred to simply as *Artemisia arbuscula*.

Evergreen Forest and Woodland Vegetation

Evergreen forest and woodland vegetation on Pioneer Mountain Ranch consists of stands dominated by *Pseudotsuga menziesii*, *Pinus flexilis*, and *Abies lasiocarpa*. These coniferous forest stands occur on relatively steep, northwest-, north-, to northeast-facing slopes in the headwaters of Fish and Muldoon creeks. Eleven coniferous forest associations observed within the study area are represented within four mapping units. Relatively small stands of *Abies lasiocarpa*/*Acer glabrum* and *Abies lasiocarpa*/*Carex geyeri* were observed in slope crest positions in the headwater tributaries of Fish Creek. These stands are mapped as inclusions within stands of *Pseudotsuga menziesii* forest.

Pseudotsuga menziesii and *Pinus flexilis* Series

Six *Pseudotsuga menziesii* plant associations were observed in the study area (Table 2). The principal associations within the area are *Pseudotsuga menziesii*/*Calamagrostis rubescens*, *Pseudotsuga menziesii*/*Festuca idahoensis*, and *Pseudotsuga menziesii*/*Symphoricarpos oreophilus*. Two *Pinus flexilis* associations were observed within the area. Only *Pinus flexilis*/*Festuca idahoensis*, however, was repeatedly observed in significant abundance. *Pseudotsuga menziesii* and *Pinus flexilis* plant associations within the upland portion of the Pioneer Mountains study area are described by Steele et al. (1981).

Pseudotsuga menziesii*/*Calamagrostis rubescens

(Douglas-fir/pinegrass)

Distribution: *Pseudotsuga menziesii*/*Calamagrostis rubescens* stands within the study area are all the *Calamagrostis rubescens* phase. The association occurs 5,160 to 9,000 feet elevation in upper portions of Iron Mine Creek, the eastern tributaries of Fish Creek, Long Canyon, and Thompson Creek on north- to northwest-facing, moderate to steep slope bottoms, side slopes, and slope crests.

Composition: Species composition varies with stand structure and seral status. The majority of stands sampled are mid-seral due to both timber harvest activities and fire disturbance. Medium-sized *Pseudotsuga menziesii* form a moderately open forest canopy. Dispersed shrubs are common: *Ceanothus velutinus*, *Ribes cereum*, and *Symphoricarpos oreophilus*. *Calamagrostis rubescens* and *Carex geyeri* form a patchy to continuous low-growing, bunchy perennial grass sward. *Koeleria cristata* may also be present. Associated herbaceous species are numerous, including *Arnica cordifolia*, *Arnica sororia*, *Aster perelegans*, *Balsamorhiza sagittata*, *Castilleja miniata*, *Crepis acuminata*, *Eriophyllum lanatum*, *Frasera speciosa*, *Geranium viscosissimum*, *Potentilla glandulosa*, *Senecio integrifolia*, *Senecio streptanthifolius*, and *Thalictrum venulosum*.

Pseudotsuga menziesii*/*Festuca idahoensis

(Douglas-fir/Idaho fescue)

Distribution: All *Pseudotsuga menziesii*/*Festuca idahoensis* stands observed in the study area were classified as the *Festuca idahoensis* phase. As with PSME/CARU, CARU, the association occurs in upper portions of Iron Mine Creek, the eastern tributaries of Fish Creek, Long Canyon, and Thompson Creek. PSME/FEID, FEID is located on northeast- and west- to northwest-facing, moderate to steep slope bottoms, side slopes, and slope crests and very steep side slopes at 5,150 to 8,950 feet elevation.

Composition: The majority of the stands sampled are late-seral old growth. Large diameter *Pseudotsuga menziesii* form an open canopy over patchy medium-sized and sapling understory establishment. Patchy shrub understory cover (consisting of *Artemisia tridentata* vaseyana and *Symphoricarpos oreophilus*) is typically restricted to larger forest canopy gaps. Understory forbs, sedges, and perennial bunchgrasses are well represented to abundant (in combination). Frequently observed understory species include *Agropyron trachycaulum*, *Antennaria microphylla*, *Carex geyeri*, *Carex rossii*, *Crepis acuminata*,

Eriophyllum lanatum, *Festuca idahoensis*, *Leukopoa kingii*, *Lupinus argenteus*, *Phlox diffusa*, and *Senecio integrifolia*. Large diameter dead-and-down *Pseudotsuga menziesii* are common.

***Pseudotsuga menziesii*/Symphoricarpos oreophilus**
(Douglas-fir/mountain snowberry)

Distribution: *Pseudotsuga menziesii*/Symphoricarpos oreophilus occurs in the upper portions of Iron Mine Creek, the eastern tributaries of Fish Creek, Long Canyon, and Thompson Creek. Stands are typically located on east-, southeast-, south-, to southwest-facing moderate to steep slope bottoms, side slopes, and slope crests and very steep side slopes and slope bottoms at 6,360 to 8,700 feet elevation.

Composition: Late-seral, large-tree dominated stands sampled in the study area typically occur with a moderately open to open *Pseudotsuga menziesii* canopy. Understory tree establishment is relatively uncommon. *Symphoricarpos oreophilus* and *Ribes cereum* form a medium height, intermittent deciduous shrub canopy. *Artemisia tridentata vaseyana*, *Berberis repens*, *Ribes montigenum*, and *Shepherdia canadensis* may also be present. Frequently observed grasses and forbs are: *Agastache urticifolia*, *Agropyron trachycaulum*, *Arnica cordifolia*, *Castilleja miniata*, *Elymus glaucus*, *Festuca idahoensis*, *Geranium viscosissimum*, *Koeleria cristata*, *Lupinus argenteus*, *Penstemon attenuatus*, *Potentilla glandulosa*, *Rubus idaeus*, *Senecio integerrimus*, *Silene menziesii*, and *Thalictrum venulosum*.

Conservation and Management Considerations - *Pseudotsuga menziesii* Associations: Fire disturbance is an important ecological process in many *Pseudotsuga menziesii* ecosystems. Relatively frequent, low intensity fire, on these moderately productive sites, maintains open stands of large diameter *Pseudotsuga menziesii* with patchy *Pseudotsuga menziesii* understory regeneration and a patchy mosaic of understory shrub, grass, and herb cover. This fire disturbance regime functions to thin understory tree regeneration, favoring the structural and compositional dominance of Douglas-fir in the overstory and reducing the development of pole-sized ladder fuels (Agee 1993; Crane and Fischer 1986).

It is difficult to generalize about the potential use of prescribed fire within the study area due to the complex variability in stand structure and composition. *Pseudotsuga menziesii* stands on mid- and upper-slope positions within the Pioneer Mountain Ranch study area are primarily dominated by large-diameter trees. These stands appear to have been maintained by moderately frequent, low intensity fire. Heterogenous understory fuels range from dense accumulations of medium-sized standing dead and downed trees to open stands of large-diameter trees with a continuous perennial grass sward understory. Cautiously applied prescribed fire may benefit mid- and late-seral old growth forest within the study area by re-establishing moderately attenuated fire disturbance processes and reducing the risk of loss due to a more intensive wildfire event.

Stands of *Pseudotsuga menziesii* forest communities range from A- to BC-ranked condition. The majority of stands sampled are A- or AB-ranked. Poorer conditions generally occur on lower slope positions. These stands were historically selective harvested and currently receive heavy use by sheep. Bare soil is often extensive in stands used repeatedly to bed sheep. The understory composition of these sites is severely altered. These sites are especially vulnerable to establishment of exotic plant species, including noxious weeds.

Recent partial cut harvest activity has occurred in *Pseudotsuga menziesii* stands on the eastern tributaries of upper Fish Creek. Numerous populations of *Centaurea diffusa* and *Centaurea maculosa* were located on logging roads in the area. Logging operations in the area resulted in conditions that are suitable for the spread of *Centaurea diffusa* and *Centaurea maculosa* off road beds to adjacent slopes. Eradication of these populations and control of these species in *Pseudotsuga menziesii* forest communities should be given high management priority.

***Pinus flexilis*/Festuca idahoensis**
(limber pine/Idaho fescue)

Distribution: *Pinus flexilis/Festuca idahoensis* was observed primarily on southwest-, west-, northwest-, to north-facing moderate to steep slope bottoms, side slopes, and slope crests. Stands are located in the headwaters of the eastern tributaries of Fish Creek and Iron Mine Creek at 7,800 to 9,000 feet elevation.

Composition: Stands sampled are mid- and late-seral, medium- and large-tree dominated. Well spaced large diameter *Pseudotsuga menziesii* are typically dominant in the overstory. More numerous medium-sized *Pinus flexilis* and *Pseudotsuga menziesii* also contribute to the moderately open to (more frequently) open tree canopy. *Artemisia tridentata vaseyana* and *Symphoricarpos oreophilus* are the principal constituents of the patchy medium shrub layer which is most prominent in larger tree canopy gaps. *Ribes montigenum* is often also present. Dense perennial bunchgrass cover alternates with patches of stabilized talus. Frequently observed grasses are *Festuca idahoensis* and *Leukopoa kingii*. Commonly associated herbaceous species include *Aster perelegans*, *Balsamorhiza sagittata*, *Carex geyeri*, *Castilleja flava*, *Crepis acuminata*, *Eriophyllum lanatum*, *Hackelia micrantha*, *Lupinus argenteus*, *Penstemon fruticosus*, *Penstemon humilis*, *Phacelia hastata*, *Senecio integerrimus*, and *Senecio streptanthifolius*. At higher elevations *Arnica congesta*, *Eriogonum caespitosum*, *Eriogonum ovalifolium*, *Phacelia sericea*, and *Phlox diffusa* are increasingly important.

Stands of *Pinus flexilis/Leukopoa kingii* are also prominent within the study area. These stands are mapped as inclusions within *Pinus flexilis/Festuca idahoensis*. *Pinus flexilis* and *Pseudotsuga menziesii* are often co-dominant within *Pinus flexilis/Leukopoa kingii*. For this reason, over 95 percent of the *Pinus flexilis* stands within the study area occur as the *Pseudotsuga menziesii-Pinus flexilis/Festuca idahoensis* coertype (Figure 5; Table 3).

Conservation and Management Considerations: All of the *Pinus flexilis/Festuca idahoensis* stands observed on Pioneer Mountain Ranch are in excellent, high quality representative condition.

Deciduous Forest and Woodland Vegetation

Populus tremuloides Series

Seven *Populus tremuloides* plant associations were observed on the upland portions of the Pioneer Mountain Ranch study area (Table 2). Three of the associations occurred with higher frequency and predictability: *Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Bromus carinatus*, *Populus tremuloides/Bromus carinatus*, and *Populus tremuloides/Symphoricarpos oreophilus/Calamagrostis rubescens*. *Populus tremuloides* plant associations on the upland portions of the study area are described by Mueggler (1988).

Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Bromus carinatus
(aspen/service berry-mountain snowberry/California brome)

Distribution: *Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Bromus carinatus* was located on southeast- to west-facing gentle to moderate side slopes and slope bottoms. Stands occur at 5,160 to 8,660 feet elevation on up-slope seeps or within the riparian zone and on adjacent slopes of major streams within the study area: both Copper creeks, Cottonwood Creek, Iron Mine Creek, and Thompson Creek.

Composition: Late-seral (degraded) stands dominated by medium-sized *Populus tremuloides* were most frequently sampled. The moderately open to closed deciduous forest canopy is typically multi-layered. Tall shrubs (*Amelanchier alnifolia*, *Prunus virginiana*, or *Salix scouleriana*) are prominent. Dispersed *Artemisia tridentata vaseyana*, *Chrysothamnus viscidiflorus*, or *Symphoricarpos oreophilus* are often present. Tall perennial grass species, including *Agropyron trachycaulum*, *Bromus carinatus*, and *Elymus glaucus*, are well represented and often structurally co-dominant in the understory with tall herbaceous species, such as *Heracleum lanatum*, *Osmorhiza occidentale*, and *Senecio serra*. Other common

herbaceous associates include *Agastache urticifolia*, *Circaea alpina*, *Geum macrophylla*, *Hackelia micrantha*, *Silene menziesii*, *Smilacina racemosa*, *Smilacina stellata*, *Thalictrum venulosum*, and *Urtica dioica*.

Populus tremuloides/Bromus carinatus

(aspen/California brome)

Distribution: *Populus tremuloides/Bromus carinatus* was observed on southeast-, south-, to west-facing gentle slope bottoms. Stands occur at 5,290 to 7,460 feet elevation within the riparian zone and on adjacent dry flats of major streams within the study area.

Composition: The stands that were sampled are mid- and late-seral. The stands are characterized by dispersed medium-sized *Populus tremuloides*; abundant pole-sized trees are frequently present. The understory is grass- and forb-dominated. Frequently observed species include *Agastache urticifolia*, *Agropyron trachycaulum*, *Bromus carinatus*, *Elymus cinereus*, *Elymus glaucus*, *Geranium viscosissimum*, *Osmorhiza occidentale*, *Silene menziesii*, *Stipa columbiana*, *Thalictrum venulosum*, and *Urtica dioica*. *Poa pratensis* is well represented to abundant in stands sampled. All *Populus tremuloides/Bromus carinatus* stands within the study area are mapped as *Populus tremuloides/Poa pratensis* (Figure 5; Table 3).

Populus tremuloides/Symphoricarpos oreophilus/Calamagrostis rubescens

(aspen/mountain snowberry/pine grass)

Distribution: *Populus tremuloides/Symphoricarpos oreophilus/Calamagrostis rubescens* occurs on northwest-, north-, to northeast-facing gentle to steep side and bottom slopes. Stands are most common on the east slope of the southern extent of the Pioneer Mountains. Elevation ranges from 5,150 to 8,715 feet.

Composition: The mid- and late-seral stands sampled are primarily structural characterized by pole-sized trees. The moderately open to closed deciduous canopy is dominated by *Populus tremuloides*. The interrupted understory medium shrub layer is dominated by *Symphoricarpos oreophilus*, *Artemisia tridentata vaseyana*, *Ceanothus velutinus*, *Purshia tridentata*, and *Ribes cereum* are often also present. *Calamagrostis rubescens* typically forms a patchy, lush sward. *Agropyron trachycaulum*, *Carex rossii*, *Festuca idahoensis*, and *Koeleria cristata* are important perennial grass and sedge species. Common herbaceous associates include *Antennaria microphylla*, *Arnica cordifolia*, *Epilobium angustifolium*, *Geranium viscosissimum*, *Gilia aggregata*, *Lupinus argenteus*, *Penstemon attenuata*, *Senecio streptanthifolius*, *Silene menziesii*, and *Smilacina racemosa*.

Conservation and Management Considerations - *Populus tremuloides* Associations: *Populus tremuloides* stands are popular among many of the seasonal and year-round ungulate residents of the Pioneer Mountain Ranch area. Stands are primarily BC- to CD-ranked. A- and AB-ranked stands are rare. Nearly all the stands visited are grazed by livestock. Mid- and upper-slope stands are often trailed and terraced due to livestock traffic. Lower-slope stands adjacent water supplies are heavily used by livestock for grazing and loafing. Severe impacts of livestock grazing and trampling resulting in heavily churned, bare soil are localized to extensive in stands on the southeastern slopes of the central Pioneer Mountain ridgeline. Aspen regeneration is low in heavily impacted, lower-slope stands but appears adequate in mid- and upper-slope stands.

Management of aspen within the study area should prioritize restoration or maintenance of understory native perennial grass (especially), forb, and shrub cover. This will be accomplished most effectively through a dramatic reduction in livestock utilization of these stands. Once native perennial grass cover is re-established in severely degraded stands, prescribed fire may be beneficial for the maintenance of successional and structural dynamics.

Evergreen Shrubland Vegetation

Fifteen evergreen shrubland plant associations were observed in the Pioneer Mountain Ranch study area (Table 2). These are primarily *Artemisia tridentata* *vaseyana*-dominated plant associations. Hironaka et al. (1983) provide the principal descriptive work for sagebrush vegetation in southern Idaho. The work of Jensen et al. (1988), Nelson and Jensen (1987), Bowerman et al. (1997), Lewis and Riegelhuth (1964), and Schlatterer (1972) is also pertinent to the study area.

Moderately- to highly degraded, or early-seral, stands of evergreen shrubland may be mapped as the Annual grassland, *Elymus cinereus* Group, *Agropyron cristata* Group, or *Agropyron spicatum* Group coovertype. Relationships between the existing vegetation (coovertype) and potential natural vegetation of a particular site are best understood by examining Table 3. The *Elymus cinereus* Group and *Agropyron spicatum* Group coovertypes occur only on *Artemisia tridentata* *vaseyana*/*Elymus cinereus* and *Artemisia tridentata* *vaseyana*/*Agropyron spicatum* potential natural vegetation sites, respectively. The Annual grassland and *Agropyron cristata* Group coovertypes, however, occur on a wide range of different potential natural vegetation sites.

The *Artemisia tridentata* *wyomingensis*-*Chamaebatiaria millifolium*/*Poa secunda* is identified as occurring within the study area. The association occurs on basalt of the Carey Flow. No sampling occurred within this vegetation as these site were initially not included in the study area. Though it appears in Figures 4 and 5, there is no further discussion of the plant association. The composition and distribution of the association should be investigated in further detail.

Artemisia tridentata *vaseyana* Series

Artemisia tridentata* *vaseyana*-*Symphoricarpos oreophilus*/*Agropyron spicatum
(mountain big sagebrush-mountain snowberry/bluebunch wheatgrass)

Distribution: *Artemisia tridentata* *vaseyana*-*Symphoricarpos oreophilus*/*Agropyron spicatum* was observed on southeast-, south-, to west-facing moderate to steep side slopes and high-elevation bottom slopes. Stands occur throughout the study area at 5,280 to 9,140 feet elevation.

Composition: The plant association is characterized by a dense shrub canopy of *Artemisia tridentata* *vaseyana* and *Symphoricarpos oreophilus*. A suite of other mountain shrub species such as *Prunus virginiana*, *Amelanchier alnifolia*, or *Ribes cereum* are often also present. *Purshia tridentata* is often abundant. *Agropyron spicatum*, *Bromus carinatus*, *Melica bulbosa*, *Carex rossii*, and *Stipa occidentalis* are the principal grass species. Herbaceous associates include: *Achillea millefolium*, *Balsamorhiza sagittata*, *Castilleja pallescens*, *Eriogonum heracleoides*, *Eriophyllum lanatum*, *Geranium viscosissimum*, *Hieracium albertinum*, *Lithospermum ruderales*, *Lupinus sericeus*, *Mertensia obligifolia*, and *Zigadenus venenosus*.

Approximately 65 percent of the stands sampled within the study area are classified as moderately open (> 25, ≤ 40 percent total shrub cover); 35 percent are described as open (> 15, ≤ 25 percent total shrub cover). Approximately 62 percent of the stands are medium height (1.6 - 2.5 feet); 38 percent possess a medium to tall shrub canopy (2.6 - 4.0 feet).

Artemisia tridentata* *vaseyana*-*Symphoricarpos oreophilus*/*Festuca idahoensis
(mountain big sagebrush-mountain snowberry/Idaho fescue)

Distribution: Stands of the plant association were observed on west-, north-, to northeast-facing moderate to steep side slopes and high-elevation bottom slopes. The *Artemisia tridentata* *vaseyana*-*Symphoricarpos oreophilus*/*Festuca idahoensis* association occurs at 5,160 to 9,150 feet

elevation throughout the study area. Stands are typically confined to concaved micro-topographical features and often occur over relatively small areas.

Composition: Stands of the plant association are characterized by a moderately open to open shrub canopy of *Artemisia tridentata vaseyana* and *Symphoricarpos oreophilus*. *Ceanothus velutinus*, *Amelanchier alnifolia*, *Purshia tridentata*, and *Prunus virginiana* are often also present with varying abundance. Understory grass and forb species are often abundant. Principal grass species are *Festuca idahoensis*, *Agropyron spicatum*, *Koeleria cristata*, and *Poa secunda*. *Antennaria microphylla*, *Balsamorhiza sagittata*, *Calochortus eurycarpus*, *Castilleja miniata*, *Crepis acuminata*, *Eriogonum heracleoides*, *Hackelia micrantha*, *Lupinus argenteus*, *Phlox longifolia*, *Senecio integrifolia*, and *Silene douglasii* are commonly associated herbaceous species.

Structural characteristics of the stands sampled within the study area are diverse. Most stands are moderately open (55 percent); a minority were open (20 percent). Most of the mid- to late-seral stands sampled are medium height (57 percent); medium to tall stands are also well represented (30 percent). Early-seral stands of the association were classified as having a low, open to very open shrub canopy.

Artemisia tridentata vaseyana/Agropyron spicatum
(mountain big sagebrush/bluebunch wheatgrass)

Distribution: *Artemisia tridentata vaseyana/Agropyron spicatum* occurs in large, extensive stands at 5,160 to 9,190 feet elevation on southeast-, south-, and southwest-facing moderate to steep side and bottom slopes. The plant association is extensive throughout the study area.

Composition: The moderately open to open medium shrub canopy is dominated by *Artemisia tridentata vaseyana*. In mid-seral stands, dispersed *Chrysothamnus viscidiflorus* or *Chrysothamnus nauseosus* are often present. *Agropyron spicatum* and *Poa secunda* are the dominant perennial grass species and typically abundant on high quality sites. *Sitanion hystrix* may also be present, especially with early- to mid-seral conditions. Commonly associated and characteristic forbs include: *Allium acuminata*, *Astragalus purshii*, *Balsamorhiza sagittata*, *Castilleja pallescens*, *Chaenactis douglasii*, *Crepis acuminata*, *Cryptantha torreyi*, *Eriogonum heracleoides*, *Eriogonum umbellatum*, *Eriogonum microthecum*, *Fritillaria pudica*, *Lithospermum ruderales*, *Lupinus argenteus*, *Machaeranthera canescens*, *Mertensia obliquifolia*, *Penstemon humilis*, *Phacelia hastata*, *Phlox longifolia*, and *Zigadenus venenosus*.

The structural condition of stands of *Artemisia tridentata vaseyana/Agropyron spicatum* that were sampled is primarily medium tall (1.6 - 2.5 feet) and moderately open (> 25, ≤ 40 percent cover) (59 and 60 percent, respectively). Thirty-six percent of the stands are classified as tall (2.6 - 4.0 feet). An open canopy was present on 36 percent of the stands sampled.

Artemisia tridentata vaseyana/Elymus cinereus

(mountain big sagebrush/basin wildrye)

Distribution: The *Artemisia tridentata vaseyana/Elymus cinereus* plant association was observed on moist flats and gentle side slopes in the valley bottoms of Muldoon, Fish, Copper, Barn, and Cottonwood creeks. Elevations range from 5,150 to 9,203 feet. Most stands occur between 5,600 and 6,114 feet elevation.

Composition: Open *Artemisia tridentata vaseyana* occurs with abundant perennial grass cover consisting of *Elymus cinereus* and *Festuca idahoensis*. Common herbaceous species include *Achillea millefolium*, *Erigeron pumilus*, *Geranium viscosissimum*, *Lupinus argenteus*, and *Potentilla glandulosa*. *Chrysothamnus viscidiflorus* is often common to well represented in early- and mid-seral stands.

Many *Artemisia tridentata vaseyana/Elymus cinereus* sites on the Pioneer Mountain Ranch are early- or mid-seral. Open shrub or herb-dominated structures are most frequent. Among the stands sampled, 71 percent are medium tall shrubland; 29 percent are herb-dominated.

Artemisia tridentata vaseyana/Festuca idahoensis

(mountain big sagebrush/Idaho fescue)

Distribution: *Artemisia tridentata vaseyana/Festuca idahoensis* was the most frequently sampled association on the Pioneer Mountain Ranch. The association is widespread throughout the study area (Table 3) and occupies approximately 30 percent of the area. Stands occur primarily on west-, north-, to northeast-facing moderate to steep bottom and side slopes and slope crests. The association was observed at 5,160 to 9,190 feet elevation.

Composition: Moderately open to open stands of the association are dominated by *Artemisia tridentata vaseyana*. Dispersed individual *Amelanchier alnifolia*, *Ceanothus velutinus*, *Chrysothamnus viscidiflorus*, and *Tetradymia canescens* may also be present in varying combinations and abundance. *Festuca idahoensis* is often abundant, forming dense bunchgrass cover in the interspace of (especially) late-seral, open stands of the association. *Agropyron spicatum*, *Koeleria cristata*, *Poa secunda*, and *Stipa occidentalis* are frequently common to well represented. Herbaceous species often include *Antennaria microphylla*, *Arnica congesta*, *Arnica sororia*, *Balsamorhiza sagittata*, *Castilleja hispida*, *Castilleja pallescens*, *Collinsia parviflora*, *Crepis acuminata*, *Erigeron bloomeri*, *Eriogonum heracleoides*, *Lupinus argenteus*, *Phlox hoodii*, *Phlox longifolia*, and *Senecio integerrimus*.

Structural conditions in stands sampled range from open grassland to medium tall, dense shrubland. Medium tall and moderately open shrubland structures were most frequently observed (in 63 and 55 percent of the stands, respectively). Ten and 23 percent of the stands are classified, respectively, as medium tall and low shrub. Forty-two percent of the stands possess an open canopy. Four percent of the stands sampled are early-seral and structurally dominated by perennial bunchgrass and herbaceous species.

Artemisia tridentata vaseyana/Poa secunda

(mountain big sagebrush/Sandberg's bluegrass)

Distribution: The *Artemisia tridentata vaseyana/Poa secunda* community type was observed at 5,400 to 6,150 feet elevation on the valley bottom flats and southeast-, south-, to west-facing gentle side slopes of Copper and Cottonwood creeks and Barn Canyon.

Composition: *Artemisia tridentata vaseyana* is typically dominant in moderately open to open stands of the community type. Dispersed, *Chrysothamnus viscidiflorus* or *Chrysothamnus nauseosus* are often present. *Poa secunda* is the principal perennial grass species. *Balsamorhiza sagittata*, *Eriogonum microthecum*, *Lithospermum ruderale*, and *Lupinus argenteus* are frequently observed in the often

relatively sparse stands. The successional status of many stands identified as *Artemisia tridentata vaseyana*/*Poa secunda* is not known (though they are likely early- or mid-seral). For this reason the community is referred to as a community type rather than a plant association.

Medium height and moderately open shrubland is the predominant structural condition (50 and 45 percent of stands, respectively), compared to medium tall height and open canopy conditions (27 and 36 percent, respectively). Eighteen percent of the stands sampled are early-seral and dominated by perennial bunchgrass species.

Conservation and Management Considerations - *Artemisia tridentata vaseyana* Associations: *Artemisia tridentata vaseyana* communities provide a range of important wildlife habitats. The response of *Artemisia tridentata vaseyana* communities to natural and anthropogenic disturbance is reflective of *Artemisia tridentata vaseyana* itself as well as the individual responses of the dominant understory perennial bunchgrass species.

Stands of the associations are A- through D-ranked (Table 3). The associations which occur in lower slope positions (moderate side slopes and slope bottoms) and on south-facing slopes (ARTRV-SYOR/AGSP, ARTRV/AGSP, and ARTRV/POSE) tend to be in more degraded ecological condition compared to the associations which occur on upper slope positions and north-facing slopes (ARTRV-SYOR/FEID and ARTRV/FEID).

Artemisia tridentata vaseyana provides winter forage of relatively high nutritive value for both wild ungulates and sheep. *Artemisia tridentata vaseyana* communities may provide important summer, winter, and spring-fall habitat for mule deer and elk (Hironaka et al. 1983; Bradley 1986a). *Artemisia tridentata vaseyana* is, however, highly susceptible to fire mortality. Re-establishment after fire occurs through the introduction of seed from adjacent stands and germination of seed stored in the soil surface horizons. Repeated fire disturbance may result in prolonged loss of *Artemisia tridentata vaseyana* cover due to the lack of a proximal or stored seed source (Hironaka et al. 1983; Bradley 1986a; Johnson and Simon 1987).

Agropyron spicatum is considered one of the most important forage species for wildlife and livestock, though it is not the most highly preferred species (Sours 1983; Zlatnik 1999). *Agropyron spicatum* is moderately tolerant to grazing only during the seasonal periods when it is not growing. It is extremely sensitive to defoliation (by herbivory or fire) during the active growing season (Blaisdell and Pechanec 1949; Britton et al. 1990; McLean and Wikeem 1985). *Agropyron spicatum* is considered a grazing decreaser. Heavy grazing results in stand degradation and mortality of individual bunchgrass plants.

Plant communities in which *Agropyron spicatum* is dominant may be relatively resistant to fire. Seasonal timing, however, largely determines the effect of fire. *Agropyron spicatum* has coarse stems and little leafy material. In the dormant, period dry leaf material and stems burn rapidly and little heat is transferred down toward the leaf meristem located at the soil surface. Plant associations in which *Agropyron spicatum* is the dominant perennial bunchgrass are most severely affected by fire that occurs during the growing season, prior to dormancy (Zamora 1989).

Cumulative effects of fire and livestock grazing are significant. Stands of *Agropyron spicatum* exposed to fire and subsequent grazing show higher bunchgrass mortality and lower productivity and reproduction than stands that are exposed only to fire. Wild and domestic ungulates often congregate on recently burned stands as *Agropyron spicatum* regrowth is a highly palatable and preferred forage (Bunting et al. 1998; Moomaw 1956; Strang 1989).

The response of *Artemisia tridentata vaseyana* plant associations to disturbance is influenced by the presence of annual grass species. The presence of exotic annual grass species, especially *Bromus tectorum*, is a concern on lower-elevation, south-facing slopes on Pioneer Mountain Ranch. The early spring growth phenology of *Bromus tectorum* confers a competitive advantage over *Agropyron spicatum* in

seedling establishment. *Bromus tectorum* is able to germinate and initiate root growth at cooler soil temperatures and continue to grow throughout winter. In spring the annual species is able to competitively capture soil surface moisture before initiation of significant root growth has occurred in *Agropyron spicatum* (Harris 1967). Increased abundance of annual grass species leads to the accumulation of fine fuels, which results in more frequent fire and the subsequent reduction in abundance of *Agropyron spicatum* (Peters and Bunting 1994; Whisenant 1990). This spiraling decline related to the invasion of annual grass species has contributed to widespread loss of the quality and distribution of *Artemisia* plant associations in which *Agropyron spicatum* is an important constituent.

The south-facing slopes of ARTRV/AGSP provide important winter range for elk. Spring grazing of these sites by livestock does not allow *Agropyron spicatum* sufficient recovery prior to the growing season and may contribute to its decline.

Festuca idahoensis is generally more fire-sensitive than *Agropyron spicatum*. Dried foliage arranged in a dense, fine-leaved tuft may continue to smolder for a considerable period after an initial fire front has passed (Bradley 1986b; Wright and Klemmedson 1965). *Festuca idahoensis* can be severely damaged by summer and fall fires; recovery may require several decades (Antos et al. 1983; Conrad and Poulton 1966; Harniss and Murray 1973). *Festuca idahoensis* appears to be least damaged by fires that occur in early spring. In spring cool, moist soil may provide protection from fire damage and promote regrowth (Bradley 1986b).

Early season livestock grazing may damage *Artemisia tridentata vaseyana* associations for several reasons. Trampling by livestock is most severe during early season with saturated soil conditions. Early season livestock use often results in soil compaction and uprooting of bunchgrasses and other native perennial plants. Early grazing *Festuca idahoensis* and *Agropyron spicatum* reduces seed formation and plant vigor. Repeated early season grazing eventually results in perennial bunchgrass mortality (Johnson and Simon 1987).

In contrast to *Artemisia tridentata vaseyana* and *Festuca idahoensis*, *Elymus cinereus* is considered highly resistant to fire. Dry coarse leaves and stems burn rapidly and insulate basal leaf meristems from prolonged heating (Bunting 1985; McMurray 1987; Wright 1985). *Elymus cinereus* is an important seral component in stands disturbed by fire (Humphrey 1984). In remnant ARTRV/ELCI stands that are subjected to intensive livestock grazing, residual *Elymus cinereus* is often restricted to the protective cover of *Artemisia tridentata vaseyana*. Following fire disturbance, these plants are susceptible to over utilization by livestock (Perry and Chapman 1975).

Elymus cinereus provides excellent cover, nesting, and bedding habitats for upland birds, small mammals, and big game (Sours 1983). The perennial grass is attractive as forage for cattle, deer, and elk in spring and fall (Wasser 1982). *Elymus cinereus*, however, is highly susceptible to damage from spring grazing and heavy utilization during the growing season (Krall et al. 1971; Perry and Chapman 1975; Roundy et al. 1983). Krall et al. (1971) and Roundy et al. (1983) recommend restricting livestock use in *Elymus cinereus* to fall and winter.

Elymus cinereus is recognized for its value in riparian restoration. The species is strongly competitive and may effectively suppress undesirable, exotic species such as *Onopordum acanthium* (McMurray 1987; Monsen 1983).

Evidence of past fire events is common in *Artemisia tridentata vaseyana* stands within the study area. Approximately 40 percent of *Artemisia tridentata vaseyana* sites within the area are either currently occupied by herbaceous covertypes or are classified as open shrubland (< 25 percent cover of shrub species). There is no apparent need for use of prescribed fire in *Artemisia tridentata vaseyana* stands within the study area. Management within these stands should prioritize re-establishment of native perennial species on lower-slope positions and valley bottoms and prevention of further decline in the

abundance of native perennial bunchgrass species. For example, areas for potential focus on re-establishment of *Elymus cinereus* are valley bottoms in Barn Canyon and Copper Creek.

Deciduous Shrubland Vegetation

Miscellaneous Series

Deciduous shrublands on the study area include *Salix*-dominated riparian thickets and mountain shrub communities. *Salix*-dominated shrubland occur on upslope seeps and springs. *Salix geyeriana*/*Carex utriculata* was the primary riparian shrubland plant association identified on upland sites within the study area. Mountain shrub communities within the study area consist of poorly defined community types: *Prunus virginiana*-*Amelanchier alnifolia* and *Ceanothus velutinus*. These communities are mapped as "Mountain Shrub Group."

Salix geyeriana*/*Carex utriculata (Geyer's willow/bladder sedge)

Distribution: The association occurs on gentle to steep slope bottoms on all aspects. Small upland occurrences of *Salix geyeriana*/*Carex utriculata* are dispersed throughout the study area.

Composition: *Salix geyeriana* forms a locally dense, dispersed tall shrub canopy. *Salix drummondiana* may be present to co-dominant. *Ribes inerme* is often present within the *Salix* thicket and occasionally forms a dense medium shrub skirt. Clumps of tall deciduous shrubs punctuate a dense sward of *Carex utriculata*. *Carex aquatilis* is often present. Commonly associated forbs include *Epilobium ciliatum*, *Geum macrophyllum*, *Mimulus guttatus*, and *Veratrum californicum*.

Conservation and Management Considerations: The stands sampled ranged from AB- to BC-ranked, though peripheral vegetation is often in poorer condition. While the association is typically heavily impacted by cattle grazing and trampling, sheep tend to avoid these sites. The stands sampled occur within sheep allotments.

Prunus virginiana*-*Amelanchier alnifolia* and *Ceanothus velutinus (chokecherry-serviceberry and sticky laurel)

Distribution: These community types occur on west-, northwest-, to north-facing moderate to steep side slopes in the headwaters of Long Canyon, Cottonwood Creek, and Fish Creek. The community types are mapped as Mountain shrub Group (Figures 4 and 5; Table 3).

Composition: Stands of *Prunus virginiana*-*Amelanchier alnifolia* and *Ceanothus velutinus* are compositionally intermediate to ARTRV-SYOR/FEID and POTR/SYOR/FEID. *Prunus virginiana* and *Amelanchier alnifolia* form a dense tall deciduous shrub canopy. *Artemisia tridentata* vaseyana and *Symphoricarpos oreophilus* may be present in the understory. The *Ceanothus velutinus* community type is characterized by extensive shrub fields of dense medium tall *Ceanothus velutinus*. *Prunus virginiana* and *Amelanchier alnifolia* may also be present. The understory composition of the two community types is similar, though more sparse within the dense canopy of *Ceanothus velutinus*. Commonly associated grasses include *Agropyron trachycaulum*, *Bromus carinatus*, and *Festuca idahoensis*. Associated herbaceous species are *Aster perelegans*, *Helianthella uniflora*, *Phacelia hastata*, *Polygonum douglasii*, and *Silene menziesii*.

Conservation and Management Considerations: The stands sampled ranged from AB- to BC-ranked, though peripheral vegetation is often in poorer condition.

Evergreen Dwarf Shrubland Vegetation

Artemisia arbuscula Series

***Artemisia arbuscula*/Agropyron spicatum**

(low sagebrush/bluebunch wheatgrass)

Distribution: *Artemisia arbuscula*/Agropyron spicatum is common on moderate east-, south-, to southwest-facing slope crests. Small and medium-sized stands are dispersed throughout the dissected wind-blown ridge systems of the central Pioneer Mountain ridge line. Stands of the association were most frequently sampled on ridge spurs south of Blizzard Mountain.

Composition: The association is characterized by low-growing, often wind-trained *Artemisia arbuscula*. Vegetative cover is often relatively sparse, but floristically diverse. *Agropyron spicatum*, *Poa secunda*, and *Sitanion hystrix* are the principal perennial grass species. Associated forbs include *Arenaria aculeata*, *Castilleja pallescens*, *Crepis modocensis*, *Lupinus argenteus*, *Penstemon humilis*, and *Phlox hoodii*.

Conservation and Management Considerations: Stands of the association range from AB- to C-ranked; BC- and C-ranked stands are predominant. These stands typically receive little livestock grazing pressure; rather, the stands appear predisposed to the establishment of exotic annual grass species, particularly *Bromus tectorum*. Many stands have burned recently. Natural disturbance factors, such as soil churning due to freeze and thaw mechanisms, may contribute to the establishment of exotic species and the subsequent degradation of stand composition. Elk sign is common. Stands of the association are often snow free in winter. Primary big game use of these stands is likely for winter forage.

***Artemisia arbuscula*/Festuca idahoensis**

(low sagebrush/Idaho fescue)

Distribution: *Artemisia arbuscula*/Festuca idahoensis is common on west-, north-, to northeast-facing moderate slope crests. Large, contiguous stands of the association are common within the study area on the broad, gentle ridge crests of the central Pioneer Mountain ridge line. Stands of the association were most frequently sampled on ridge spurs south of Blizzard Mountain.

Composition: Low-growing, open, wind-trained, and severely hedged *Artemisia arbuscula* is the dominant shrub on these sites. *Purshia tridentata* is rarely also present. *Festuca idahoensis* is typically abundant on high quality sites and may occlude the presence of *Artemisia arbuscula*. *Agropyron spicatum*, *Koeleria cristata*, *Poa secunda*, and *Stipa occidentalis* are often associated. Common herbaceous species include *Antennaria dimorpha*, *Antennaria microphylla*, *Arenaria aculeata*, *Castilleja flava*, *Castilleja pallescens*, *Crepis modocensis*, *Eriogonum caespitosum*, *Eriogonum ovalifolium*, *Haplopappus acaulis*, *Phlox hoodii*, and *Sedum lanceolatum*. On high quality, late-seral sites lichen and moss cover is often high on the shrub and bunchgrass interspaces, forming a nearly continuous netted mat among stabilized cobbles and stones.

Conservation and Management Considerations: Nearly all of the *Artemisia arbuscula*/Festuca idahoensis stands sampled are high quality, late-seral, A- or AB-ranked condition. In these conditions *Festuca idahoensis* is abundant; lichen cover is often high (approximately 80 percent interspace cover). Moderate degradation has occurred on lower slope positions due to livestock trailing and past fire events. Elk sign is common. Primary big game use of these stands is likely for winter forage. Sage grouse winter-roost sign was most frequently observed within *Artemisia arbuscula*/Festuca idahoensis stands.

***Artemisia arbuscula*/Poa secunda**

(low sagebrush/Sandberg's bluegrass)

Distribution: *Artemisia arbuscula*/*Poa secunda* is the most abundant *Artemisia arbuscula* association on the Pioneer Mountain Ranch. Large, contiguous stands of the sparse association occur on relatively shallow, rocky soils of east-, south-, to southwest-facing moderate to steep wind-blown slope crests. The association is prominent on slope crests above US Highway 20 on the southeastern end of the study area.

Composition: Open, low-growing *Artemisia arbuscula* occurs with sparse *Poa secunda*. *Sitanion hystrix* may also be present. Though these sites are relatively sparse, species diversity is often relatively high compared to adjacent, more productive sites. Associated herbaceous species include *Antennaria dimorpha*, *Arabis holboellii*, *Arenaria kingii*, *Astragalus purshii*, *Castilleja pallescens*, *Crepis occidentalis*, *Erigeron bloomeri*, *Eriogonum caespitosum*, *Eriogonum microthecum*, *Fritillaria pudica*, *Lewisia rediviva*, *Penstemon humilis*, *Phlox hoodii*, and *Sedum lanceolatum*.

Conservation and Management Considerations: The *Artemisia arbuscula*/*Poa secunda* stands sampled are primarily late-seral, A- and AB-ranked. Many stands occur on high elevation slope crests that are exposed to few altering mechanisms. B- and BC-ranked stands occur on steep, lower elevation slope crests that tend to be predisposed to the establishment of *Bromus tectorum*. Elk sign is common. Primary big game use of these stands is likely for winter forage.

Perennial Grassland and Forb Vegetation

Festuca idahoensis Series

A diverse range of upland perennial grass-dominated plant communities was observed on the Pioneer Mountain Ranch. Though this diversity is represented by one map unit, (*Festuca idahoensis* Group) two most abundant plant associations are discussed in greater detail: *Festuca idahoensis*-*Agropyron trachycaulum* and *Festuca idahoensis*/*Lupinus argenteus*. Other tentative associations identified in upland portions of the study area include: *Carex geyeri*/*Lupinus argenteus*, *Eriogonum heracleoides*/*Agropyron trachycaulum*, *Festuca idahoensis*-*Danthonia unispicata*, *Festuca idahoensis*-*Leucopoa kingii*, *Juncus parryi*, and *Stipa occidentalis*/*Lupinus argenteus*.

Festuca idahoensis*-*Agropyron trachycaulum (Idaho fescue-slender wheatgrass)

Distribution: *Festuca idahoensis*-*Agropyron trachycaulum* was observed on north- to northeast-facing steep side slopes located in the headwaters of the middle eastern tributary of upper Fish Creek. Stands are located on leeward slopes where high winter snow accumulation, latent snow cover, snow avalanche disturbance, and snow creep restrict the growth and establishment of trees and shrubs. Soil solifluction and periodic wildfire may also contribute to the maintenance of these unique subalpine perennial grasslands.

Composition: *Festuca idahoensis* and *Agropyron trachycaulum* form a dense, tufted perennial grass sward with *Leucopoa kingii*, *Koeleria cristata*, *Poa secunda*, and *Stipa columbiana*. *Carex geyeri* may also be present. *Antennaria microphylla*, *Arenaria congesta*, *Arnica sororia*, *Calochortus eurycarpus*, *Crepis acuminata*, *Eriogonum heracleoides*, *Eriophyllum lanatum*, *Frasera speciosa*, *Geum triflorum*, *Lupinus argenteus*, *Phlox diffusa*, and *Penstemon attenuatus* are associated herbaceous species.

Conservation and Management Considerations: All of the stands observed are in high quality, late-seral A-ranked condition.. Domestic livestock should not be allowed to utilize latent snowbeds for water. Grazing should not occur on these sites until after perennial grass species have set seed.

Festuca idahoensis*/*Lupinus argenteus

(Idaho fescue/silvery lupine)

Distribution: *Festuca idahoensis*/*Lupinus argenteus* is the most abundant representative of a group of plant communities (including *Carex geyeri*/*Lupinus argenteus*, *Eriogonum heracleoides*/*Agropyron trachycaulum*, *Festuca idahoensis*-*Danthonia unispicata*, and *Stipa occidentalis*/*Lupinus argenteus*) which occur in snow accumulation sites located on northeast- to east-facing steep slope crests and moderate to steep side slopes. Stands occur in concave micro-topographical features, on the leeward side of ridge and spur crests (or other well defined, sharp convex micro-topographic features) where blowing snow accumulates and snow cover persists into the growing season. Latent snow cover on these distinctive sites prevents the growth and establishment of trees and shrubs. Relatively small stands of the associations occur with regular cadence on the upper slopes of the southern end of the central Pioneer Mountain ridge line. Relatively extensive stands form mosaic networks with ARTRV/FEID on high elevation, bench slopes in the headwaters of Fish Creek and on slopes south and west of Blizzard Mountain.

Composition: Abundant *Festuca idahoensis* forms a patchy to continuous low growing perennial bunchgrass mat in association with *Koeleria cristata*, *Poa secunda*, *Stipa columbiana*, or *Stipa occidentalis*. *Lupinus argenteus* is well represented to abundant. Associated herbaceous species often include *Antennaria microphylla*, *Arenaria aculeata*, *Eriogonum heracleoides*, *Eriogonum umbellatum*, *Gayophytum diffusa*, *Phlox diffusa*, *Polygonum douglasii*, and *Spraguea umbellata*.

Conservation and Management Considerations: The majority of stands sampled are in a high quality, late-seral A-ranked condition. Degraded BC-ranked conditions occur where domestic sheep are repeatedly allowed to excessively linger on these attractive sites. Domestic livestock should not be allowed to utilize latent snowbeds for water. Grazing should not occur on these sites until after perennial grass species have set seed.

Wetland and Riparian Series

Streamside riparian mapping and assessment is being addressed by others working within the study area. Grass- and sedge-dominated wetland plant communities are, however, also common on upslope seeps and springs within the upland portions of the Pioneer Mountain Ranch study area. These communities are represented by one mapping unit, “*Carex* Wetland Group.” The mapping unit is distributed in both stream-side riparian and in upland sites. While graminoid-dominated vegetation is most abundant within the mapping unit, forb-dominated plant communities are also represented by the mapping unit. Two associations were identified on these seeps and spring sites: *Carex nebrascensis* and *Carex utriculata*.

Carex nebrascensis* and *Carex utriculata (Nebraska sedge and bladder sedge)

Distribution: Stands of the associations were observed on seeps and springs on gentle side slopes and moderate slope bottoms, on all slope aspects. Small upland occurrences of these associations are dispersed throughout the study area.

Composition: These associations are characterized by a dense sward of either *Carex nebrascensis* or *Carex utriculata*. The small stands observed in the study area encompass a relatively diverse assemblage of grass, sedge, rush, and herbaceous species, including *Artemisia ludoviciana*, *Hordeum brachyantherum*, *Juncus balticus*, *Mimulus guttatus*, *Poa pratensis*, *Rumex salicifolius*, *Urtica dioica*, and *Veratrum californica*.

BIOLOGICAL DIVERSITY SIGNIFICANCE

The global and state rarity, or conservation status, rankings for plant associations observed in the study area are listed in Table 2. The significance of a particular occurrence of a plant association, with regard to the conservation of biological diversity, may be assessed on the basis of rarity ranking and occurrence rank of the stand. Occurrence rank is a composite of three factors: size, ecological condition, and the contextual setting of the stand. Significant plant community element occurrences within the study area are listed in Table 4. The locations of significant plant community element occurrences are shown in Figure 8.

An alternative concept of biodiversity significance is representativeness (Rust 2000). This approach involves an assessment of the extent to which a particular association is represented within special management areas formally established to provide high quality, representative examples of native vegetation. Stands within the study area are highly significant from both the rarity and representativeness perspective.

Pinus flexilis/*Festuca idahoensis* stands within the Biskay management unit (upper Iron Mine Creek, Figure 8) are outstanding and highly significant occurrences based on their large size, excellent ecological condition, and relative protected setting. *Pinus flexilis* is relatively rare in Idaho and no stands are present within protected ecological reference areas located within the Challis Volcanics ecoregional section (Rust 2000) (ecoregional sections are described by McNab and Avers 1994 and Jensen et al. 1997).

Pseudotsuga menziesii/*Acer glabrum* and *Pseudotsuga menziesii*/*Berberis repens* are both assessed as relatively rare in Idaho and are poorly represented with ecological reference areas. The stands within the study area, however, appear to be relatively small and are mapped as inclusions within other associations. Stands of *Pseudotsuga menziesii*/*Calamagrostis rubescens* and *Pseudotsuga menziesii*/*Festuca idahoensis* within the Biskay management unit are outstanding and significant occurrences based on their large size, excellent ecological condition, and relatively high potential for protection. Stands of these associations are located in upper Iron Mine Creek and the eastern tributaries of upper Fish Creek (Figure 8). *Pseudotsuga menziesii*/*Calamagrostis rubescens* is moderately rare within the State and is poorly represented within ecological reference areas located within the Challis Volcanics ecoregional section. *Pseudotsuga menziesii*/*Festuca idahoensis* is considered rare within the State. No reference stands are currently within a formally established conservation site within the region.

The conservation status of *Populus tremuloides* deciduous forest and woodland vegetation is not well known within the State. Large *Populus tremuloides* occurrences with BC-ranked ecological condition are likely significant for the conservation of biological diversity within the Challis Volcanics ecoregion.

Artemisia tridentata *vaseyana* and *Artemisia arbuscula* associations are relatively common and abundant throughout their extensive ranges. A number of *Artemisia tridentata* *vaseyana* and *Artemisia arbuscula* plant associations, however, are poorly represented within the statewide network of natural areas and ecological reference areas. Due to large size and high quality, representative condition, stands of the following plant associations within the study area present highly significance conservation opportunity: *Artemisia tridentata* *vaseyana*-*Symphoricarpos oreophilus*/*Agropyron spicatum*, *Artemisia tridentata* *vaseyana*-*Symphoricarpos oreophilus*/*Festuca idahoensis*, *Artemisia tridentata* *vaseyana*/*Agropyron spicatum*, *Artemisia arbuscula*/*Agropyron spicatum*, and *Artemisia arbuscula*/*Festuca idahoensis*. These stands occur throughout the study area (Figure 8). No occurrences of these associations are known to be present within designated conservation areas. That is, there are no stands that are formally recognized to serve as long-term ecological references for these major components of the vegetation within the Challis Volcanics ecoregional section.

Rare sagebrush associations within the study area include *Artemisia tridentata* *vaseyana*/*Elymus cinereus* and *Artemisia arbuscula* *thermopola*/*Festuca idahoensis* (Table 2). Most of the *Artemisia tridentata* *vaseyana*/*Elymus cinereus* visited on Pioneer Mountain Ranch was somewhat degraded. One stand of *Artemisia arbuscula* *thermopola*/*Festuca idahoensis* was located in the headwaters of Pole

Canyon on the Biskay management unit (Figure 8). Other shrubland communities of significant biological diversity value include: high elevation *Artemisia tridentata vaseyana* on the summit and ridgecrests of Blizzard Mountain; *Artemisia tridentata vaseyana*/*Leucopoa kingii* located on the ridgecrests of the central Pioneer Mountains ridge; and *Artemisia tridentata spiciformis*/*Carex geyeri* located in the upper Iron Mine Creek drainage.

Many of the perennial grassland communities within the Pioneer Mountain Ranch study area are not well enough known to have been given a global or state rarity rank (Table 2). Further investigation is needed in this area. Of particular apparent conservation significance are the *Festuca idahoensis*-*Agropyron trachycaulum* grasslands located in the upper tributaries of Fish Creek. *Festuca idahoensis*-*Leucopoa kingii* stands located on the upper slopes of Blizzard Mountain are small but of significant biodiversity conservation value.

FLORA

Vascular plant species observed on the study area are listed in Appendix 2.

Rare Plant Species: Populations of four rare plant species occur on sites adjacent the Pioneer Mountain Ranch study area: *Allium anceps*, *Antennaria arcuata*, *Haplopappus insecticruris*, and *Phacelia inconspicua* (Idaho Conservation Data Center 2003a). A new population of *Haplopappus insecticruris* was located in the upper Fish Creek drainage. Excellent habitat for *Phacelia inconspicua* was observed on the southeastern slopes of the central Pioneer Mountain ridgeline.

Haplopappus insecticruris is considered rare and uncommon globally and statewide but is not considered to be imperiled. The species is locally endemic to Camas and Blaine counties. Populations occur in gravelly to heavy clay soil in ephemerally moist meadows. Seventy-seven occurrences are known within the species' relatively narrow range. The Pioneer Mountain Ranch study area occurs on the eastern extent of the species' known range (Figure 9).

A population of 100 *Haplopappus insecticruris* plants was located in a 30 x 100 meter area on a bench north of the middle eastern tributary of upper Fish Creek (T3N/R23E, northwest quarter of Section 27) (Figure 9). A thorough survey of the ephemeral sedge meadow was completed. Approximately 75 percent of the plants were vegetative; 5 percent were flowering; and 20 percent were in fruit. The site is heavily grazed and trampled by domestic sheep. Causal relationships between livestock grazing and the growth and reproduction of *Haplopappus insecticruris* have not been rigorously investigated.

Phacelia inconspicua is considered imperiled globally and critically imperiled statewide. The species is a regional endemic with very few known populations. The 0.5-2 dm tall annual herb with congested clusters of small pale blue or whitish flowers is known from seven populations rangewide. The species occurs on north- and northeast-facing slopes at 5,030 to 7,920 feet elevation on loose, sandy soils rich in organic matter, often in areas with latent snow melt. Plants were observed in June 2001 at known populations adjacent the Pioneer Mountain Ranch study area (Murphy 2001). While excellent habitat was located on the study area, no plants were located. This species would likely benefit from additional survey work within the study area.

Non-native Plant Species: Five noxious weed species were observed in 39 different populations within the study area: *Centaurea diffusa*, *Centaurea maculosa*, *Cirsium arvense*, *Onopordum acanthium*, and *Sonchus arvensis* (Figure 10 and Table 5).

Centaurea diffusa, *Centaurea maculosa*, and *Cirsium arvense* represent the most extensive and numerous noxious weed species observed. Populations of *Cirsium arvense* are more numerous than indicated in this report. This species occurs primarily in streamside riparian zones and were not thoroughly inventoried. Large populations of *Centaurea diffusa* and *Centaurea maculosa* occur along

roadways in Copper Creek and Cottonwood Creek and along the southern toe slope of the Pioneer Mountains. These populations may serve as sources for dispersal to new locations. Attention should be given to containing the enlargement of the populations and avoiding spread from the populations by livestock and vehicles.

Numerous small *Centaurea diffusa* and *Centaurea maculosa* populations of one to two plants were located along logging roads located in the eastern tributaries of Fish Creek (Figure 10). These populations appear to represent new establishment of the species within the study area. These populations pose significant threats for increasing the rangewide distribution of the noxious weed species within the study area. These relatively small, numerous populations should be targeted for eradication by removal of all plant material and seed sources from the sites.

Three populations of *Onopordum acanthium* were located, all in the vicinity of Riley Canyon and along Fish Creek Road downstream of the confluence of Riley Canyon with Fish Creek. Populations along the road appeared to have been treated during the field season. Of greatest concern is the population located on the divide between Riley Canyon and Walton Canyon (Figure 10). This remote population requires special attention to avoid allowing this destructive noxious weed species to increase within the study area.

Two populations of *Sonchus arvensis* were located in Cottonwood Creek drainage (Figure 10).

FAUNA

Animal species known or expected to occur in the Pioneer Mountain Ranch study area are listed in Appendix 3. The results of pellet group counts are summarized in Table 6. The number of pellet group counts obtained for some of the species in individual plant association mapping units strongly influences the mean number of pellet groups observed per acre. For example, only one pellet group count was observed for individual species in the following mapping units: *Festuca idahoensis* Group, *Populus tremuloides*/*Amelanchier alnifolia*-*Symphoricarpos oreophilus*/*Bromus carinatus*, and *Populus tremuloides*/*Bromus carinatus*. Likewise, one pellet group count was obtained for individual mapping units for the following species: bear, coyote, coyote/wolf, moose, small rodent, and unknown ungulate. Data for these species is considered unreliable and is not summarized in Table 6.

On a number of occasions the pellet groups for cow and sheep were too numerous to count. This situation occurs in stands with poor ecological condition (less than C-ranked). The values reflected in Table 6 for cows and sheep are representative of A- through C-ranked ecological conditions.

Elk was the most frequently observed wild ungulate sign. Considering the wild ungulates, elk show the highest levels of use in *Artemisia arbuscula*/*Agropyron spicatum*; *Artemisia arbuscula*/*Festuca idahoensis*; *Artemisia arbuscula*/*Poa secunda*; *Artemisia tridentata* vaseyana-*Symphoricarpos oreophilus*/*Agropyron spicata*; and *Pseudotsuga menziesii*/*Calamagrostis rubescens*, *Calamagrostis rubescens*. Elk use was highest in *Artemisia arbuscula*/*Poa secunda* and *Pseudotsuga menziesii*/*Calamagrostis rubescens*, *Calamagrostis rubescens*. Antelope and deer are comparatively (considering the wild ungulates) most abundant in *Artemisia tridentata* vaseyana-*Symphoricarpos oreophilus*/*Festuca idahoensis*, *Artemisia tridentata* vaseyana/*Agropyron spicata*, *Artemisia tridentata* vaseyana/*Festuca idahoensis*, and *Artemisia tridentata* vaseyana/*Poa secunda*. Antelope and deer use is likely highest in *Artemisia tridentata* vaseyana-*Symphoricarpos oreophilus*/*Festuca idahoensis*.

Sage grouse sign was most frequently observed in *Artemisia tridentata* vaseyana/*Festuca idahoensis*. Droppings were most abundant in *Artemisia arbuscula*/*Festuca idahoensis*. Sage grouse clearly utilize lower elevation slope crests as winter range.

Conclusions with Management and Monitoring Recommendations

The objectives of the study are to prepare a high resolution, comprehensive vegetation map for the study area at the scale of 1:24,000; provide documentation of the composition and structure of major vegetative cover types; conduct rare plant inventories; identify unique, rare, or outstanding exemplary stands of vegetation; estimate livestock and wildlife use of the area; and provide recommendations for management and monitoring within the three units of the Pioneer Mountain Ranch.

Based on intensive field sampling, maps depicting potential natural vegetation, existing vegetative cover, stand structural condition, and stand ecological condition were derived using spatial relationships between an unsupervised classification of Landsat-generated imagery and modeled landform.

Pioneer Mountain Ranch encompasses extensive areas of high quality vegetation. In particular, stands located on steep, mid- and upper-slope positions are largely in a high quality, representative condition. Numerous unique, outstanding exemplary plant community element occurrences are present within the study area.

Important components of the vegetation have been degraded and are susceptible to further degradation based on the seasonal timing and intensity of fire disturbance and livestock use. Critical lower-slope and valley bottom habitats within the study area have been heavily impacted by the cumulative effects of livestock grazing, exotic species introductions, and fire disturbance. Conservation management strategies need to focus on (1) significant reduction of the number of livestock and the seasons of livestock use within the area, (2) wildfire prevention, (3) direct mitigation and restoration of degraded habitats, and (4) a monitoring and evaluation system.

Livestock (cattle and sheep) use is the principle ecological mechanism to begin downward trends in vegetative condition and the quality of habitats present on Pioneer Mountain Ranch. The number and season of livestock use within the study area must be reduced from customary levels in order to simultaneously maintain existing high quality habitat conditions while also restoring those habitats that are degraded.

Native perennial bunchgrass species (*Elymus cinereus*, *Festuca idahoensis*, *Poa secunda*, and *Agropyron spicatum*) are key components of the shrubland ecosystems of the Pioneer Mountain Ranch. These species provide both important ecological and commercial resource values. The long lived, deep rooted perennial bunchgrass species native to the area also serve a keystone role in the maintenance of ecosystem stability and resilience to disturbance events and environmental change. Loss of the abundance and vigor of bunchgrass triggers the raveling (perhaps eventually irreversible) decay of ecosystem integrity, and the capability of these sites to produce wildlife habitat and commercial resource values. In order to maintain and enhance ecosystem quality and commercial resource values management must result in significant and prolonged gains in the distribution and abundance of bunchgrass. The priority may be restoration of the frequency and cover of *Elymus cinereus* within the historic distribution of *Artemisia tridentata tridentata*/*Elymus cinereus*.

Adaptive management is an approach that involves the ordered steps of planning, implementing, monitoring, and evaluating. In this cyclical approach monitoring and evaluation are key links to the achievement of management objectives. A monitoring system should be established within the study area that allows the referential power, for example, of paired sampling designs. The capability to identify critical causal relationships between patterns in resource utilization and vegetation composition and structure, the quality of wildlife habitats, and the maintenance of biological diversity will require access to strictly controlled reference conditions. A well planned system of fenced livestock exclosures of sufficient number and size to represent long-term reference ecological conditions of the major plant associations on Pioneer Mountain Ranch should be identified and constructed.

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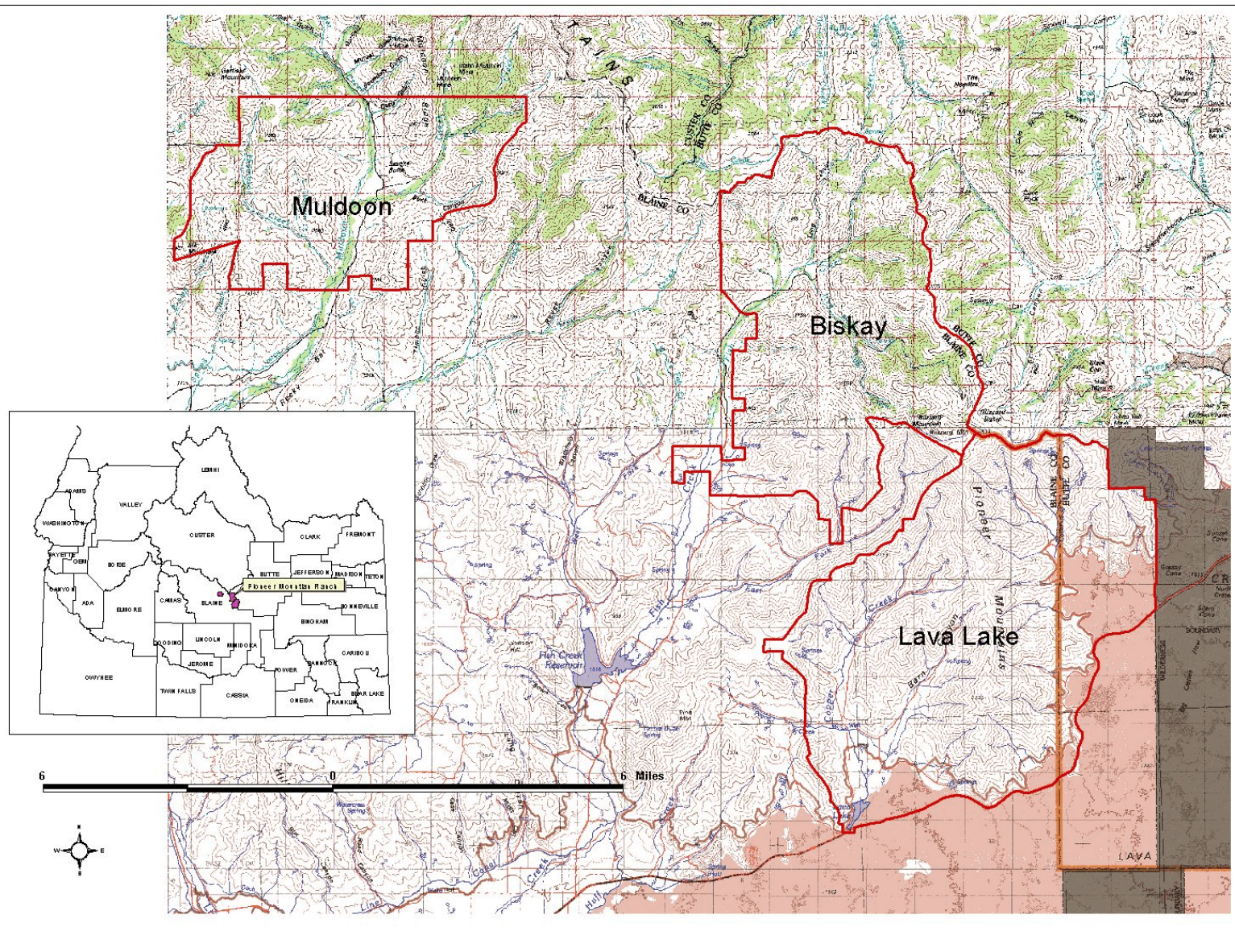


Figure 1. The location of the Pioneer Mountain Ranch study area is overlain on the USDI BLM Arco and Craters of the Moon Surface Land Management maps. The three management units within the area are labeled. Inset: The study area is shown in relation to the counties of southern Idaho.

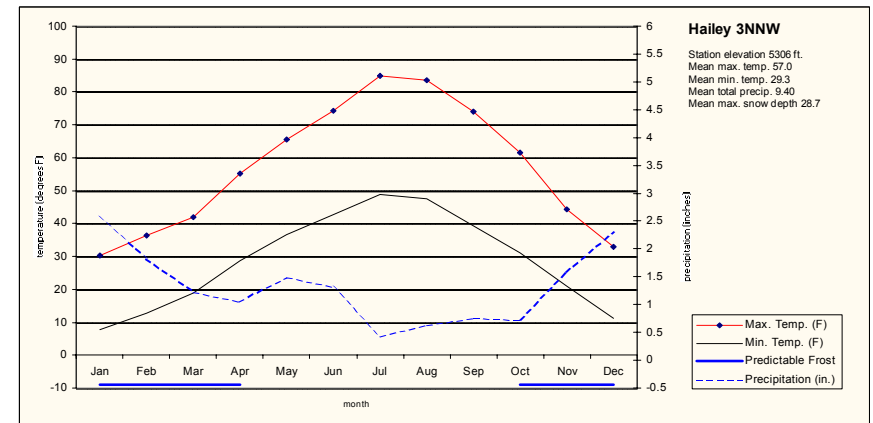
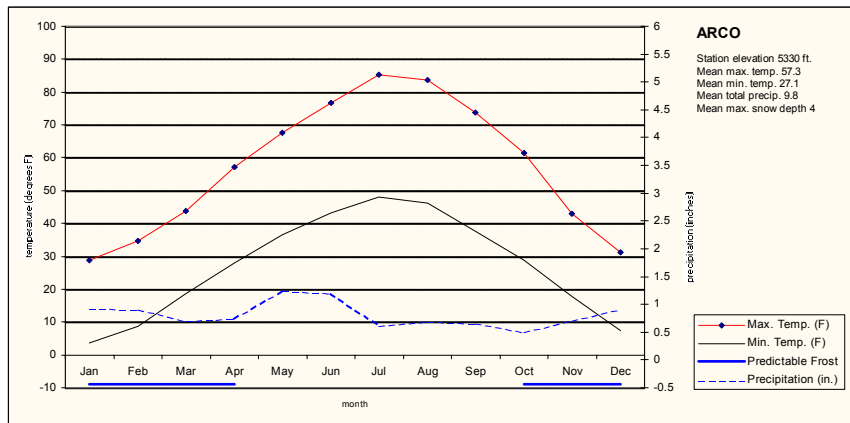
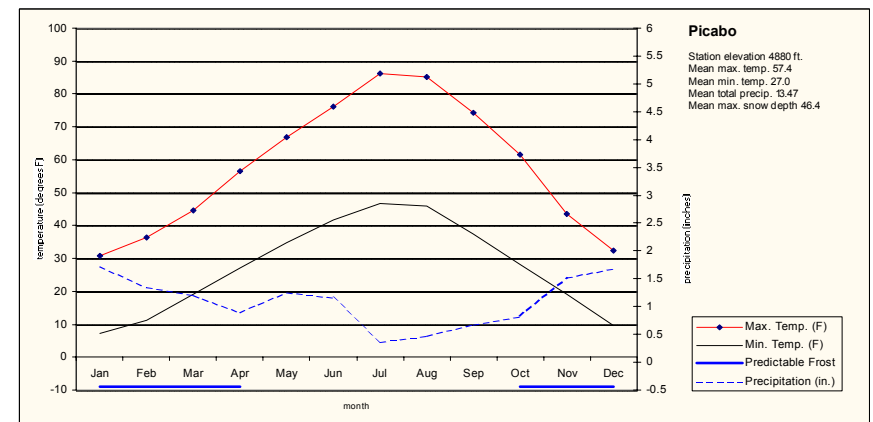
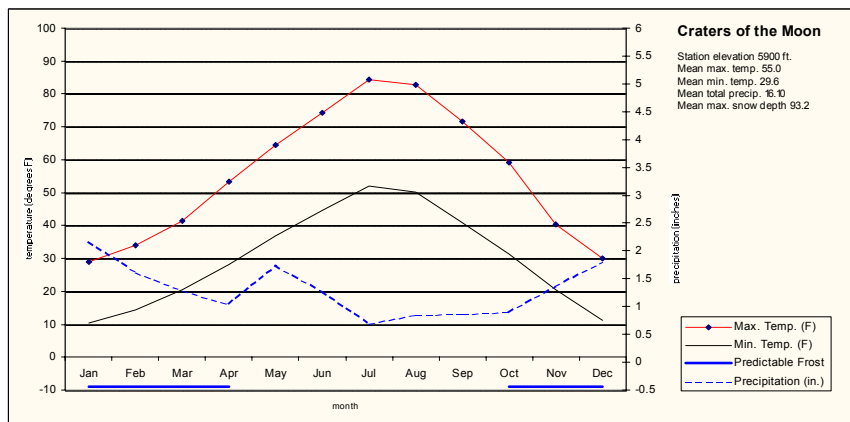


Figure 2. Climatologic al data for sites in the vicinity of Pioneer Mountain Ranch. Mean monthly maximum and minimum temperature

and precipitation are plotted for the following stations. Data acquired from Western Regional Climate Center (2001) and Abramovich et al. (1998).



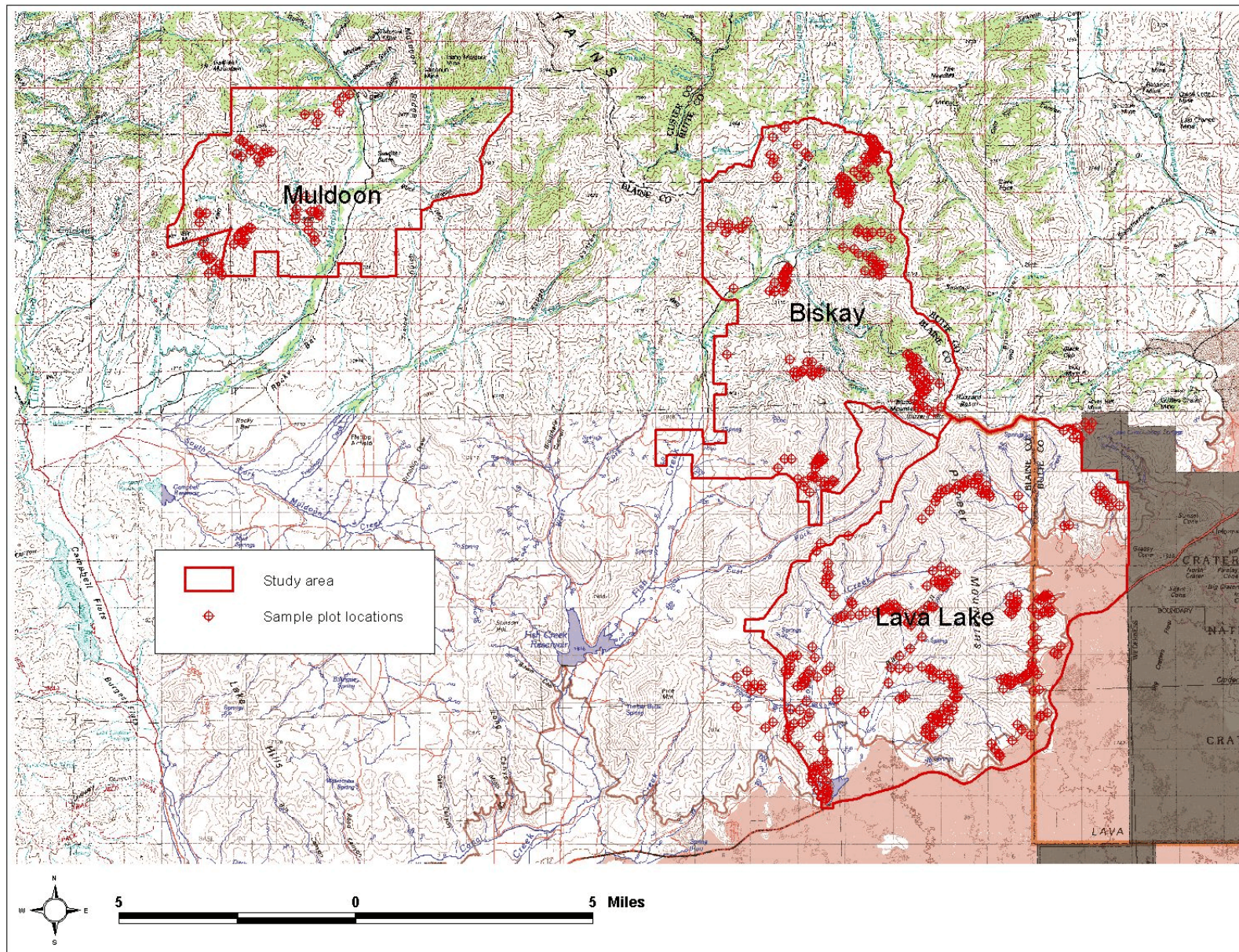


Figure 3. Sample plot locations within the Pioneer Mountain Ranch study area.

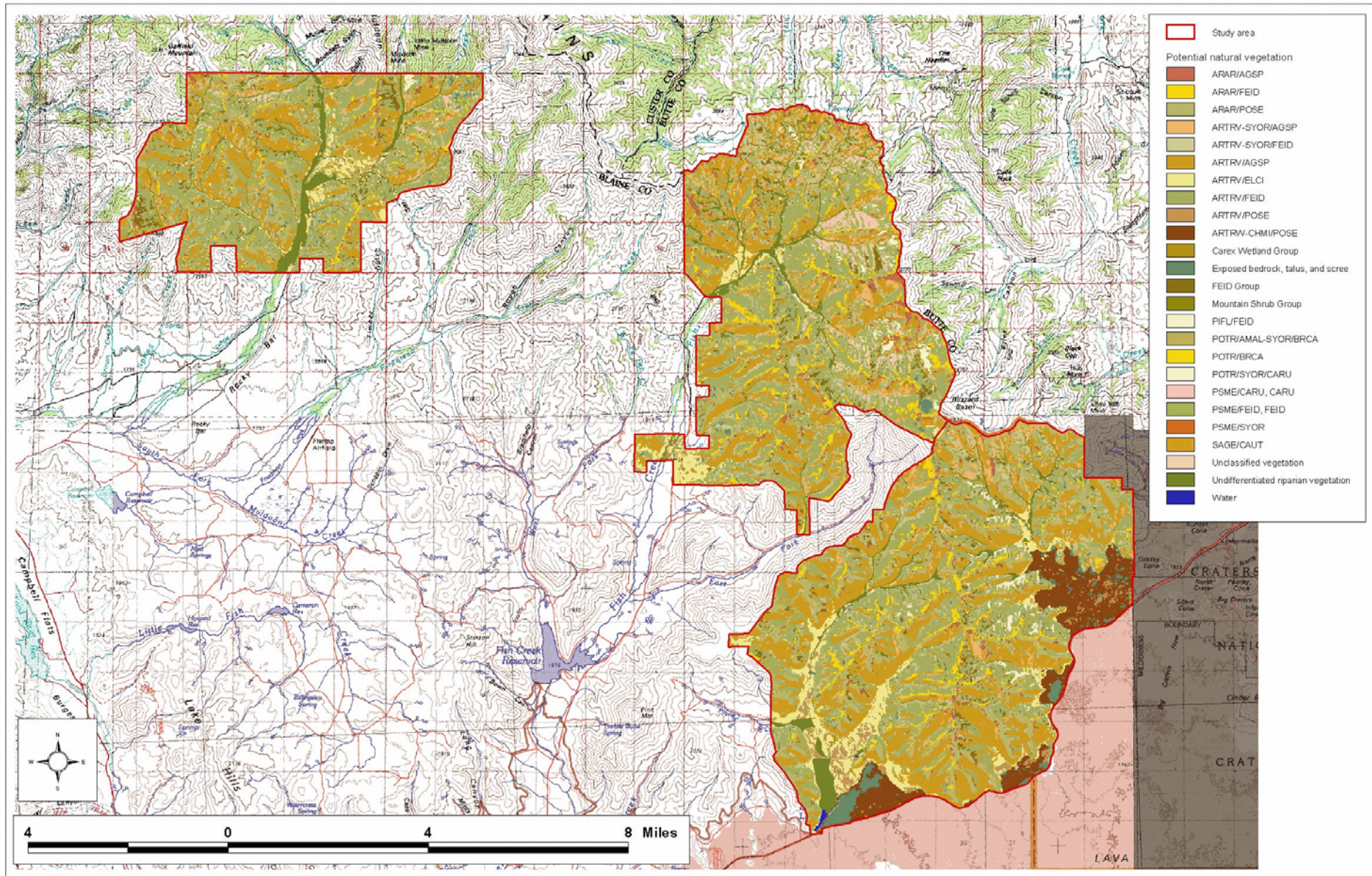


Figure 4. Potential natural vegetation of Pioneer Mountain Ranch. Vegetation mapping units are described in the text and Table 3.

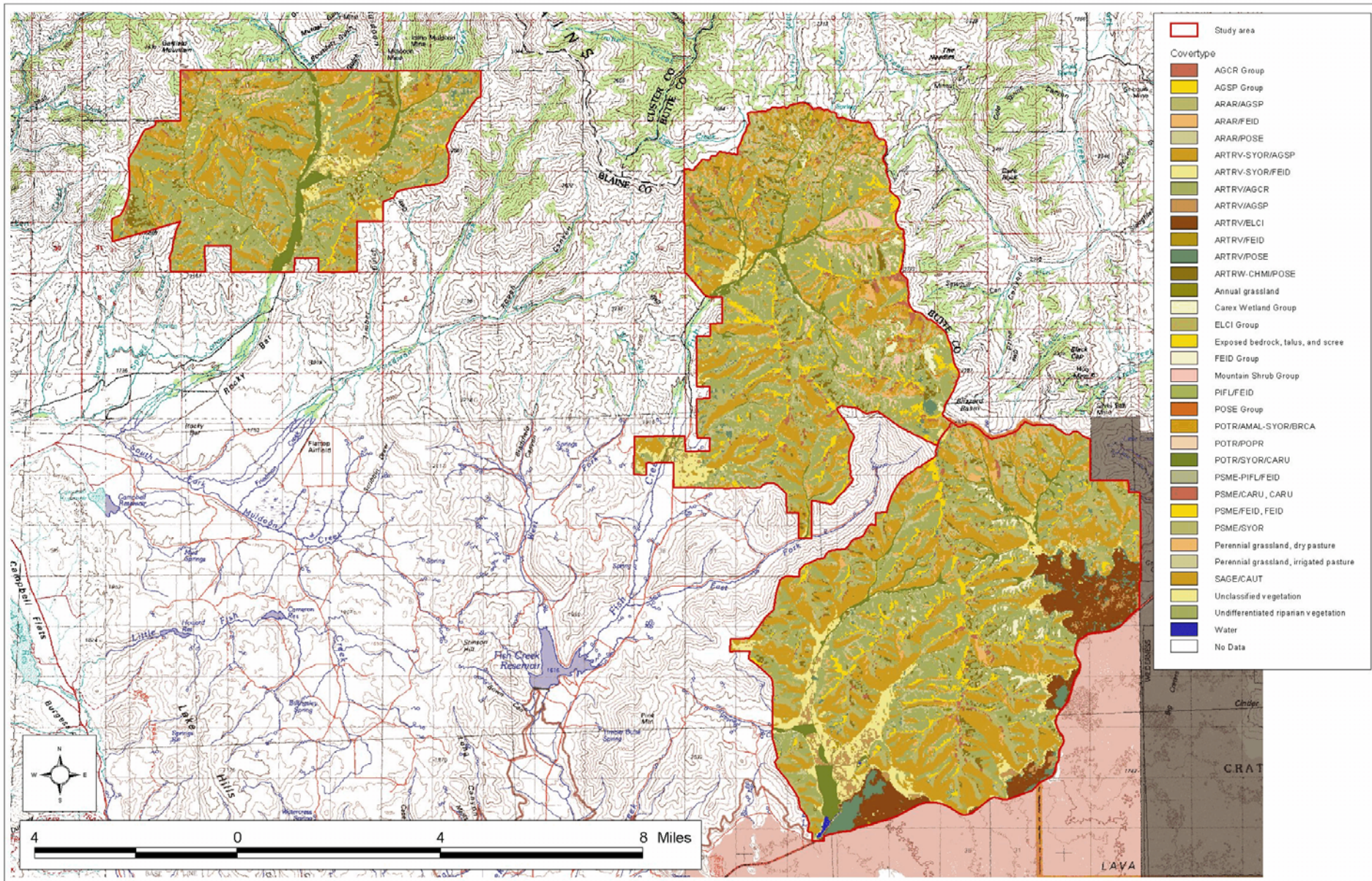


Figure 5. Existing vegetative cover on Pioneer Mountain Ranch.

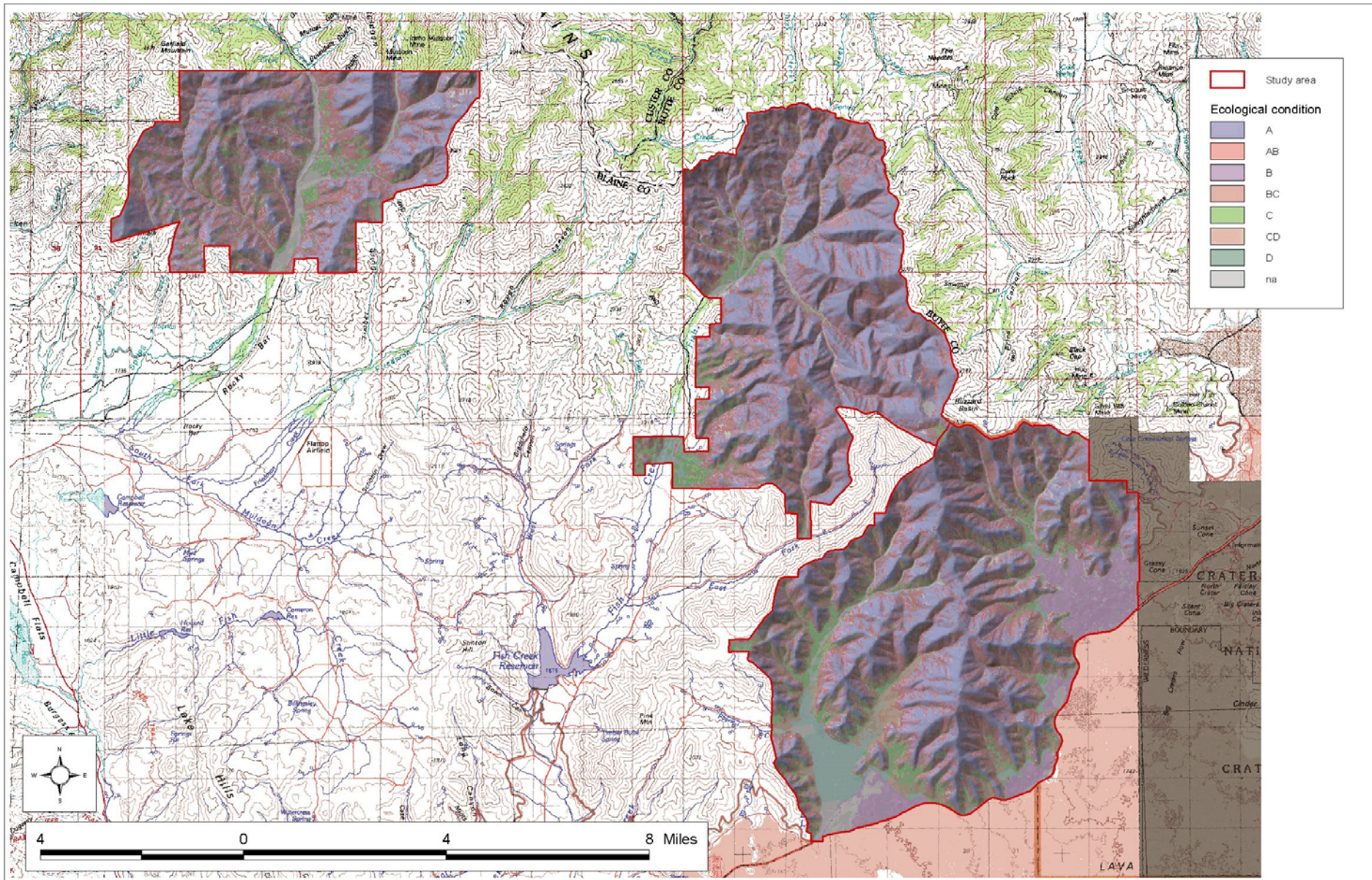


Figure 6. Ecological condition of vegetation on Pioneer Mountain Ranch.

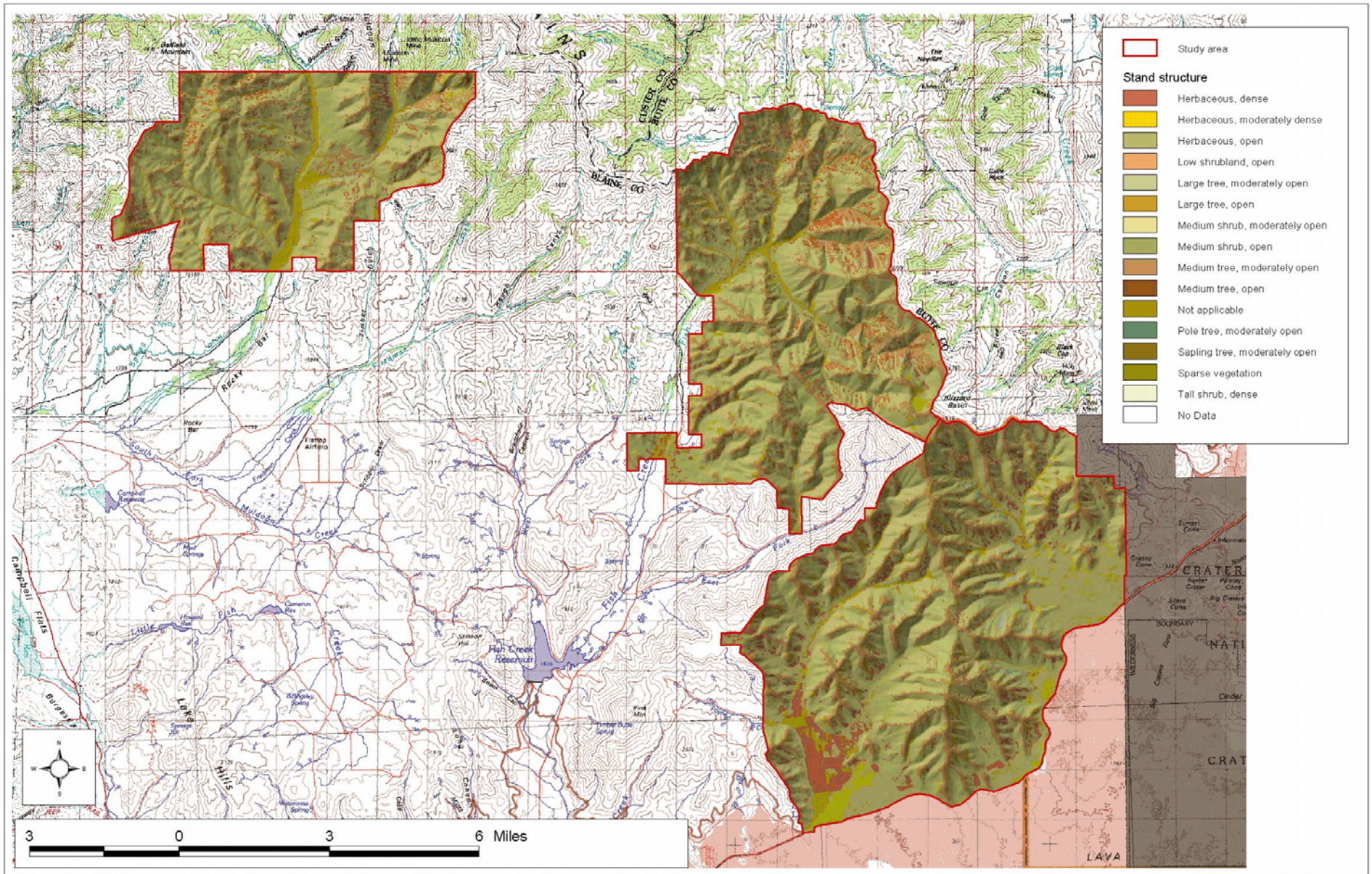


Figure 7. Structural condition of vegetation on Pioneer Mountain Ranch.

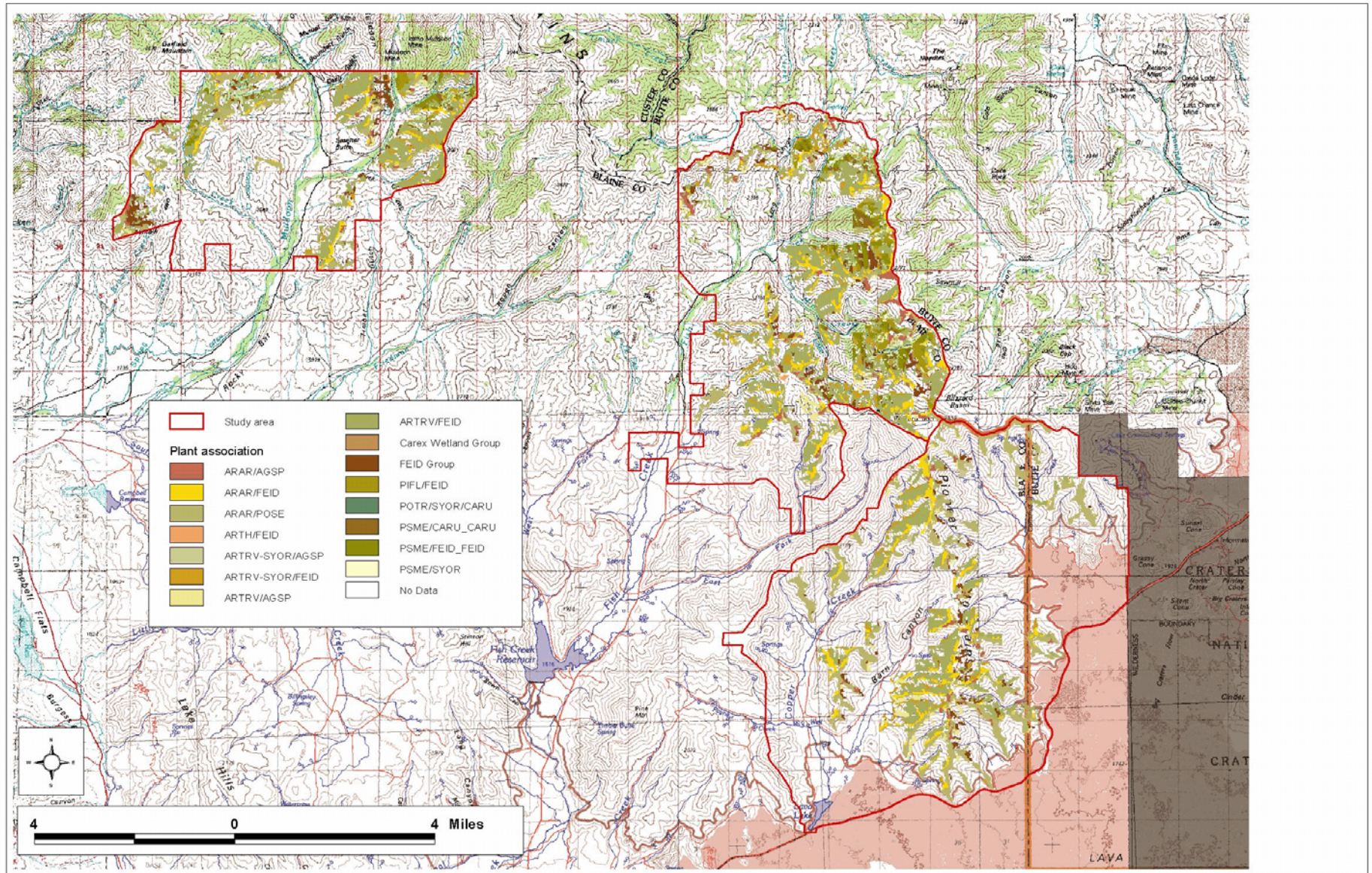


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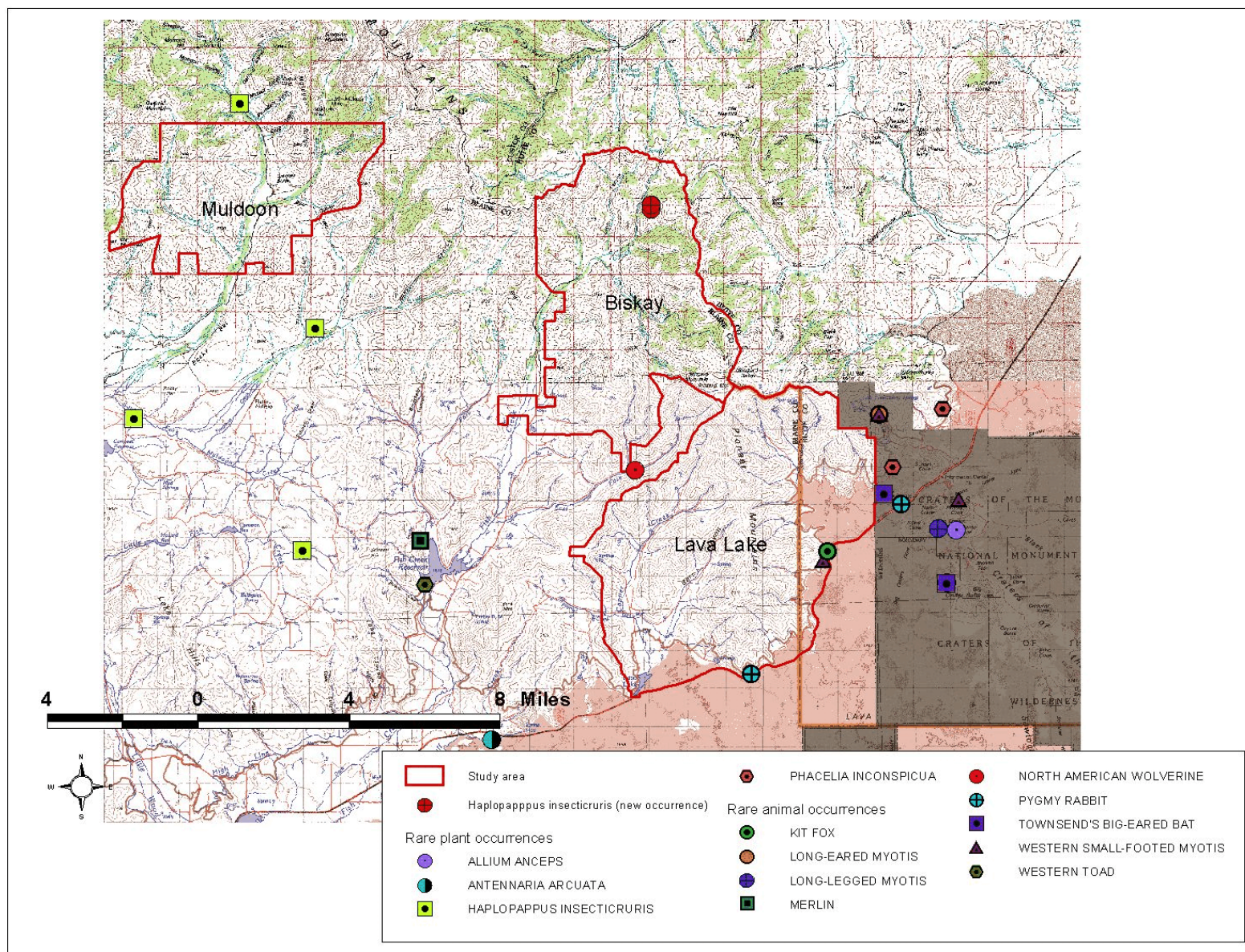


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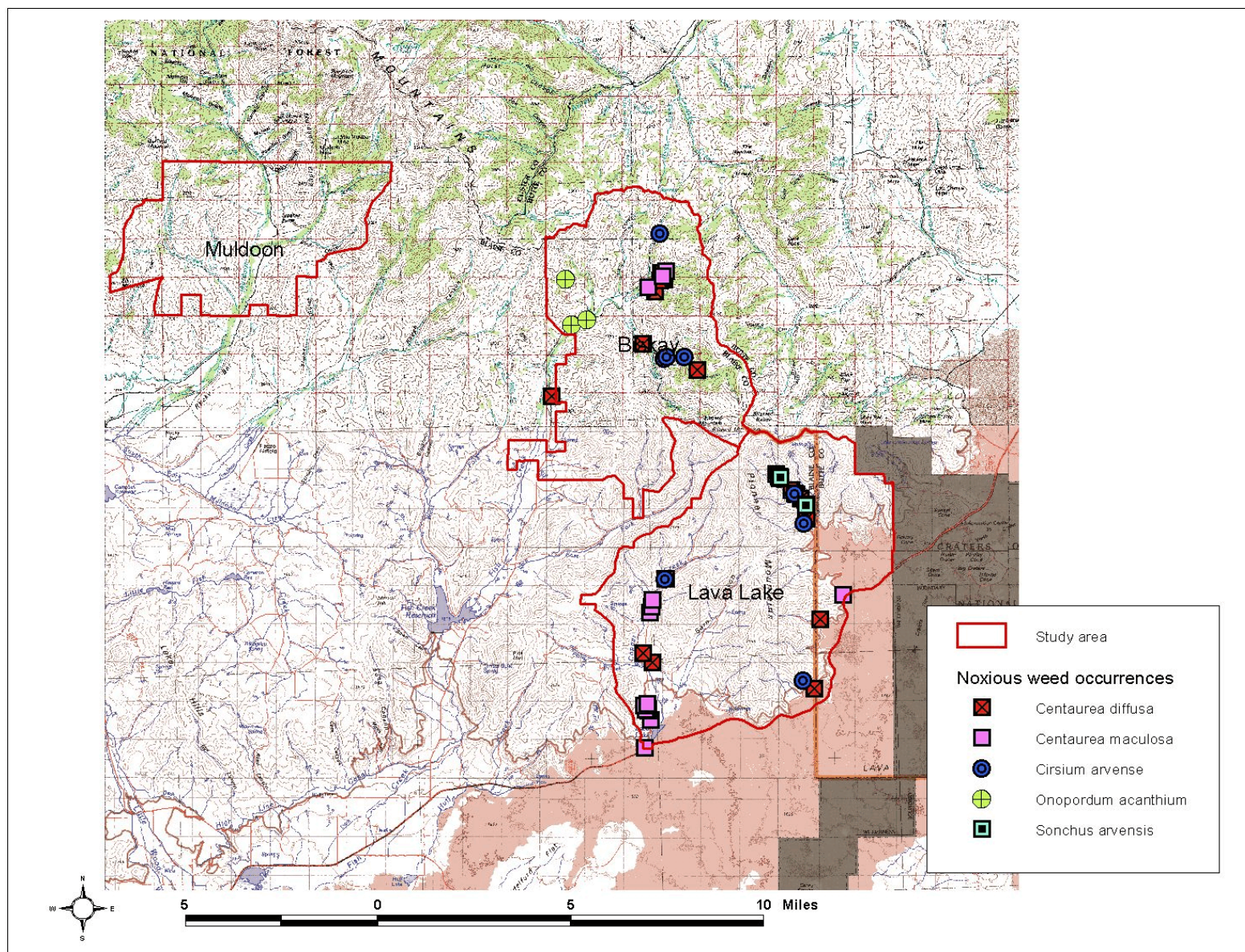


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Table 1. Summary of conventions used for classification of (a) seral status, (b) ecological condition, and (c) structural condition.

a) Seral status

Class	Description
pnc	The potential natural community; seral species are scarce to absent. Species composition and density are relatively stable. The dominant species are reproducing.
late	Late-seral species are well represented to abundant and increasing in abundance. Seral species may still persist.
mid	Late-seral species are well represented to abundant in the understory and are beginning to occupy the overstory or are present with low density and abundance.
early	Seral species are dominant in the overstory or late-seral species are present with low density and abundance or absent.
retro	Native species are either absent or so low in abundance as to make recolonization very difficult. Increasers and invaders dominate. The vegetation is disclimax. Only mechanical manipulation will result in the reintroduction of native late-seral species.

b) Ecological condition.

Class	Description
A	Pristine condition. Evidence of post-industrial human-caused disturbance is absent. Exotic species are absent.
B	Little evidence of post-industrial human-caused disturbance is present. Stand composition and structure is predominantly natural. Exotic species are only common (\leq one percent cover).
C	Post-industrial human-caused disturbance is apparent. Stand composition and structure is altered. Exotic species are well represented to abundant (5 - 25 percent cover).
D	Evidence of post-industrial human-caused disturbance is prevalent. Stand composition and structure is altered. Native species are present, but are in peril of loss. Increasers dominate the stand. Invader species are a significant compositional component.
F	Native stand composition, structure, and function are significantly altered. Re-establishment of native stand composition, structure, and function will require large energy inputs.

c) Structural condition. Structural classes recorded in the field (Appendix 1) were collapsed to reduce the number and variability of vegetation mapping units.

Class	Description
hed	dense herbaceous vegetation
hem	moderately open to closed canopied herbaceous vegetation
heo	open herbaceous vegetation
lso	low growing shrubs (0 - 1.5 feet tall) occur with an open canopy
ltm	forest vegetation dominated by large diameter trees (≥ 10 trees per acre 21 - 31.9 inches in diameter) with a moderately open canopy
lto	forest vegetation dominated by large diameter trees (≥ 10 trees per acre 21 - 31.9 inches in diameter) with an open canopy
mam	medium tall shrubs (1.6 - 2.5 feet tall) with moderately open to closed canopy cover (> 25 and ≤ 66 percent)
mao	medium tall shrubs (1.6 - 2.5 feet tall) with open canopy cover (> 10 and ≤ 25 percent)
mtm	forest vegetation dominated by medium-sized trees (≥ 10 trees per acre 9 - 20.9 inches in diameter) with a moderately open canopy
mto	forest vegetation dominated by medium-sized trees (≥ 10 trees per acre 9 - 20.9 inches in diameter) with an open canopy
na	structural classification is not applicable
pom	forest vegetation dominated by pole-sized trees (≥ 15 trees per acre 5 - 8.9 inches in diameter) with a moderately open canopy
sam	forest vegetation dominated by sapling-sized trees (≥ 20 trees per acre 1 - 4.9 inches in diameter) with a moderately open canopy
sv	sparse vegetation (the cover of vascular plants is < 10 percent)
tad	tall shrub (4 - 6.5 feet tall) with dense canopy cover (> 66 percent cover)

Table 2. Plant associations observed on the Pioneer Mountain Ranch, June - September 2001. Plant associations are listed alphabetically by series and physiognomic class (using the National Vegetation Classification system) with the association code and conservation status rank (G rank refers to global conservation status rank; S rank refers to the state conservation status rank). The rank ?? is shown when conservation status has not been determined as the plant association is poorly known or newly described.

Scientific Name	Association Code	Rank (G rank/S rank)
Evergreen Forest and Woodland		
<i>Abies lasiocarpa</i> Series		
<i>Abies lasiocarpa/Acer glabrum</i>	ABLA/ACGL	G5/S3
<i>Abies lasiocarpa/Carex geyeri</i>	ABLA/CAGE	G5/S5
<i>Pinus flexilis</i> Series		
<i>Pinus flexilis/Festuca idahoensis</i>	PIFL/FEID	G5/S2
<i>Pinus flexilis/Leucopoa kingii</i>	PIFL/LEKI	G3/S3
<i>Pseudotsuga menziesii</i> Series		
<i>Pseudotsuga menziesii/Acer glabrum, Symphoricarpos oreophilus</i>	PSME/ACGL, SYOR	G4?/S2
<i>Pseudotsuga menziesii/Berberis repens, Berberis repens</i>	PSME/BERE, BERE	G5/S3
<i>Pseudotsuga menziesii/Berberis repens, Symphoricarpos oreophilus</i>	PSME/BERE, SYOR	G5/S2
<i>Pseudotsuga menziesii/Calamagrostis rubescens, Calamagrostis rubescens</i>	PSME/CARU, CARU	G5/S3
<i>Pseudotsuga menziesii/Carex geyeri, Carex geyeri</i>	PSME/CAGE, CAGE	G4?/S4
<i>Pseudotsuga menziesii/Carex geyeri, Symphoricarpos oreophilus</i>	PSME/CAGE, SYOR	G4?/S4
<i>Pseudotsuga menziesii/Festuca idahoensis, Festuca idahoensis</i>	PSME/FEID, FEID	G4/S2
<i>Pseudotsuga menziesii/Symphoricarpos oreophilus</i>	PSME/SYOR	G5/S4
Deciduous Forest and Woodland		
<i>Populus tremuloides</i> Series		
<i>Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus</i>	POTR/AMAL-SYOR/TAL L FORB	G5/S3
<i>Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Bromus carinatus</i>	POTR/AMAL-SYOR/BRC A	G3G5/S3
<i>Populus tremuloides/Bromus carinatus</i>	POTR/BRCA	G5/S4
<i>Populus tremuloides/Symphoricarpos oreophilus/Bromus carinatus</i>	POTR/SYOR/BRCA	G5/S4
<i>Populus tremuloides/Symphoricarpos oreophilus/Calamagrostis rubescens</i>	POTR/SYOR/CARU	G3G5/S3
<i>Populus tremuloides/Symphoricarpos oreophilus/Tall forb</i>	POTR/SYOR/TALL FORB	G3G5/S2S3
<i>Populus tremuloides/Veratrum californicum</i>	POTR/VECA	G3?/S2

Scientific Name	Association Code	Rank (G rank/S rank)
Evergreen Shrubland		
<i>Artemisia tridentata</i> vaseyana Series		
<i>Artemisia tridentata</i> vaseyana-Symphoricarpos oreophilus/Agropyron spicatum	ARTRV-SYOR/AGSP	G5?/S3
<i>Artemisia tridentata</i> vaseyana-Symphoricarpos oreophilus/Bromus carinatus	ARTRV-SYOR/BRCA	G4Q/S3?
<i>Artemisia tridentata</i> vaseyana-Symphoricarpos oreophilus/Elymus cinereus	ARTRV-SYOR/ELCI	?/?
<i>Artemisia tridentata</i> vaseyana-Symphoricarpos oreophilus/Festuca idahoensis	ARTRV-SYOR/FEID	G4/S4
<i>Artemisia tridentata</i> vaseyana/Agropyron spicatum	ARTRV/AGSP	G5/S4
<i>Artemisia tridentata</i> vaseyana/Bromus carinatus	ARTRV/BRCA	G4?/S3
<i>Artemisia tridentata</i> vaseyana/Calamagrostis rubescens	ARTRV/CARU	?/?
<i>Artemisia tridentata</i> vaseyana/Elymus cinereus	ARTRV/ELCI	G4?/S2
<i>Artemisia tridentata</i> vaseyana/Festuca idahoensis	ARTRV/FEID	G5/S4
<i>Artemisia tridentata</i> vaseyana/Leucopoa kingii	ARTRV/LEKI	?/?
<i>Artemisia tridentata</i> vaseyana/Poa secunda	ARTRV/POSE	G3?/S3
<i>Artemisia tridentata</i> spiciformis/Carex geyeri	ARTRVS/CAGE	?/?
<i>Ceanothus velutinus</i> /Agropyron spicatum	CEVE/AGSP	?/?
<i>Purshia tridentata</i> /Poa secunda	PUTR/POSE	G1?Q/S1Q
Deciduous Shrubland		
<i>Prunus virginiana</i> -Amelanchier alnifolia	PRVI-AMAL	?/?
<i>Salix geyeriana</i> /Carex utriculata	SAGE/CAUT	G5/S4
Evergreen Dwarf-Shrubland		
<i>Artemisia arbuscula</i> Series		
<i>Artemisia arbuscula</i> /Agropyron spicatum	ARAR/AGSP	G5/S3
<i>Artemisia arbuscula</i> /Festuca idahoensis	ARAR/FEID	G5/S4?
<i>Artemisia arbuscula</i> /Poa secunda	ARAR/POSE	G5/S4
<i>Artemisia arbuscula</i> thermopola/Festuca idahoensis	ARART/FEID	G2/S2

Scientific Name	Association Code	Rank (G rank/S rank)
Perennial Graminoid Vegetation		
Various Series		
<i>Carex geyeri</i> / <i>Lupinus argenteus</i>	CAGE/LUAR	?/?
<i>Carex nebraskensis</i>	CANE	G4/S3
<i>Carex utriculata</i>	CAUT	G5/S4
<i>Eriogonum heracleoides</i> / <i>Agropyron trachycaulum</i>	ERHE/AGTR	?/?
<i>Festuca idahoensis</i> - <i>Agropyron trachycaulum</i>	FEID-AGTR	?/?
<i>Festuca idahoensis</i> - <i>Danthonia unispicata</i>	FEID-DAUN	?/?
<i>Festuca idahoensis</i> - <i>Leucopoa kingii</i>	FEID-LEKI	G2?/S2
<i>Festuca idahoensis</i> / <i>Lupinus argenteus</i>	FEID/LUAR	?/?
<i>Juncus parryi</i>	JUPA	?/?
<i>Stipa occidentalis</i> / <i>Lupinus argenteus</i>	STOC/LUAR	?/?

Table 3. Description and summary of vegetation mapping units. Vegetation map units are listed alphabetically by the association code shown in Figure 5. The areal extent of each map unit (and included plant associations) is summarized by structural and ecological condition class and by management unit: (a) Lava Lake, (b) Biskay, and (c) Muldoon.

A. LAVA LAKE

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
Private	ARAR/AGSP	ARAR/AGSP	A	Iso	9
	ARAR/AGSP	ARAR/AGSP	B	Iso	24
	ARAR/FEID	ARAR/FEID	A	Iso	197
	ARAR/FEID	ARAR/FEID	B	Iso	36
	ARAR/POSE	ARAR/POSE	A	Iso	494
	ARAR/POSE	Annual grassland	D	sv	0
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	AB	mam	24
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	B	mao	44
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	BC	mam	54
	ARTRV-SYOR/AGSP	ARTRV/AGCR	CD	mao	0
	ARTRV-SYOR/AGSP	Perennial grassland, irrigated pasture	D	hed	0
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	A	mao	35
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	AB	mam	253
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	B	mam	46
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	BC	mam	101
	ARTRV-SYOR/FEID	ARTRV/AGCR	CD	mam	11
	ARTRV-SYOR/FEID	Perennial grassland, irrigated pasture	D	hed	3
	ARTRV/AGSP	AGCR Group	CD	hed	7
	ARTRV/AGSP	AGSP Group	B	hem	19
	ARTRV/AGSP	AGSP Group	CD	hed	274
	ARTRV/AGSP	ARTRV/AGCR	CD	mam	6
	ARTRV/AGSP	ARTRV/AGCR	CD	mao	17
	ARTRV/AGSP	ARTRV/AGSP	A	mam	21
	ARTRV/AGSP	ARTRV/AGSP	A	mao	4
	ARTRV/AGSP	ARTRV/AGSP	B	mao	60
	ARTRV/AGSP	ARTRV/AGSP	BC	mam	374
	ARTRV/AGSP	ARTRV/AGSP	BC	mao	464
	ARTRV/AGSP	ARTRV/AGSP	C	mam	159
	ARTRV/AGSP	ARTRV/AGSP	C	mao	297
	ARTRV/AGSP	ARTRV/AGSP	CD	mam	54
	ARTRV/AGSP	Perennial grassland, irrigated pasture	D	hed	5
	ARTRV/ELCI	AGCR Group	CD	hed	0

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/ELCI	AGCR Group	CD	hem	1
	ARTRV/ELCI	AGCR Group	CD	mam	7
	ARTRV/ELCI	AGCR Group	D	hed	32
	ARTRV/ELCI	AGCR Group	D	hem	42
	ARTRV/ELCI	ARTRV/AGCR	CD	mam	167
	ARTRV/ELCI	ARTRV/AGCR	CD	mao	77
	ARTRV/ELCI	ARTRV/ELCI	C	mam	98
	ARTRV/ELCI	ARTRV/ELCI	C	mao	100
	ARTRV/ELCI	ARTRV/POSE	C	mam	59
	ARTRV/ELCI	ARTRV/POSE	C	mao	20
	ARTRV/ELCI	Annual grassland	D	sv	5
	ARTRV/ELCI	ELCI Group	C	hed	11
	ARTRV/ELCI	ELCI Group	C	hem	0
	ARTRV/ELCI	ELCI Group	D	hed	17
	ARTRV/ELCI	ELCI Group	D	hem	27
	ARTRV/ELCI	Perennial grassland, dry pasture	D	hed	58
	ARTRV/ELCI	Perennial grassland, dry pasture	D	hem	4
	ARTRV/ELCI	Perennial grassland, irrigated pasture	D	hed	143
	ARTRV/ELCI	Perennial grassland, irrigated pasture	D	hem	60
	ARTRV/FEID	ARTRV/AGCR	CD	mam	38
	ARTRV/FEID	ARTRV/AGCR	CD	mao	14
	ARTRV/FEID	ARTRV/FEID	A	mam	226
	ARTRV/FEID	ARTRV/FEID	A	mao	453
	ARTRV/FEID	ARTRV/FEID	AB	mam	42
	ARTRV/FEID	ARTRV/FEID	AB	mao	161
	ARTRV/FEID	ARTRV/FEID	B	mam	286
	ARTRV/FEID	ARTRV/FEID	B	mao	193
	ARTRV/FEID	ARTRV/FEID	BC	mam	272
	ARTRV/FEID	ARTRV/FEID	BC	mao	236
	ARTRV/FEID	ARTRV/FEID	C	mam	120
	ARTRV/POSE	AGCR Group	D	hed	88
	ARTRV/POSE	AGCR Group	D	hem	0
	ARTRV/POSE	ARTRV/AGCR	CD	mao	0
	ARTRV/POSE	ARTRV/POSE	B	mao	6
	ARTRV/POSE	POSE Group	D	hed	27
	ARTRV/POSE	POSE Group	D	hem	2
	ARTRV/POSE	POSE Group	D	heo	0
	ARTRV/POSE	Perennial grassland, dry pasture	D	hed	35

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/POSE	Perennial grassland, dry pasture	D	hem	9
	ARTRV/POSE	Perennial grassland, dry pasture	D	heo	3
	ARTRV/POSE	Perennial grassland, irrigated pasture	D	hed	76
	ARTRV/POSE	Perennial grassland, irrigated pasture	D	hem	4
	ARTRV/POSE	Perennial grassland, irrigated pasture	D	heo	47
	ARTRW-CHMI/POSE	ARTRW-CHMI/POSE	B	mam	11
	ARTRW-CHMI/POSE	Annual grassland	D	sv	2
	Carex Wetland Group	Carex Wetland Group	A	hed	4
	Carex Wetland Group	Carex Wetland Group	A	hem	0
	Carex Wetland Group	Carex Wetland Group	C	hem	10
	Carex Wetland Group	Perennial grassland, dry pasture	D	hed	0
	Carex Wetland Group	Perennial grassland, dry pasture	D	hem	3
	Carex Wetland Group	Perennial grassland, irrigated pasture	D	hed	0
	Carex Wetland Group	Perennial grassland, irrigated pasture	D	hem	15
	Exposed bedrock, talus, and scree	Exposed bedrock, talus, and scree	na	sv	89
	FEID Group	AGCR Group	CD	hed	3
	FEID Group	FEID Group	A	hed	52
	FEID Group	FEID Group	A	hem	25
	Mountain Shrub Group	Mountain Shrub Group	B	tad	6
	POTR/AMAL-SYOR/BRCA	AGCR Group	CD	hed	1
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	mtm	2
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	pom	30
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	C	mtm	13
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	CD	mtm	18
	POTR/AMAL-SYOR/BRCA	Perennial grassland, dry pasture	D	hed	0
	POTR/AMAL-SYOR/BRCA	Perennial grassland, irrigated pasture	D	hed	1
	POTR/BRCA	POTR/POPR	CD	mtm	12
	POTR/SYOR/CARU	AGCR Group	CD	hed	0
	POTR/SYOR/CARU	POTR/SYOR/CARU	A	sam	1
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	mtm	2
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	pom	139
	POTR/SYOR/CARU	POTR/SYOR/CARU	C	mtm	9
	POTR/SYOR/CARU	POTR/SYOR/CARU	CD	mtm	46
	PSME/CARU, CARU	PSME/CARU, CARU	AB	mtm	0
	PSME/CARU, CARU	PSME/CARU, CARU	B	mtm	0
	PSME/FEID, FEID	PSME/FEID, FEID	A	mtm	1

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	SAGE/CAUT	SAGE/CAUT	BC	tad	1
	Unclassified vegetation	Unclassified vegetation	na	na	0
	Undifferentiated riparian vegetation	Perennial grassland, dry pasture	D	hed	31
	Undifferentiated riparian vegetation	Perennial grassland, irrigated pasture	D	hed	134
	Undifferentiated riparian vegetation	Undifferentiated riparian vegetation	na	na	437
	Water	Water	na	na	22
Public	ARAR/AGSP	ARAR/AGSP	A	lso	127
	ARAR/AGSP	ARAR/AGSP	B	lso	172
	ARAR/FEID	ARAR/FEID	A	lso	618
	ARAR/FEID	ARAR/FEID	B	lso	81
	ARAR/POSE	ARAR/POSE	A	lso	2430
	ARAR/POSE	Annual grassland	D	sv	3
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	AB	mam	145
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	B	mao	185
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	BC	mam	158
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	A	mao	38
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	AB	mam	500
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	B	mam	205
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	BC	mam	350
	ARTRV-SYOR/FEID	ARTRV/AGCR	CD	mam	2
	ARTRV/AGSP	AGCR Group	CD	hed	35
	ARTRV/AGSP	AGCR Group	CD	hem	0
	ARTRV/AGSP	AGSP Group	A	hem	1
	ARTRV/AGSP	AGSP Group	B	hem	236
	ARTRV/AGSP	AGSP Group	CD	hed	819
	ARTRV/AGSP	ARTRV/AGCR	CD	mam	22
	ARTRV/AGSP	ARTRV/AGCR	CD	mao	55
	ARTRV/AGSP	ARTRV/AGSP	A	mam	97
	ARTRV/AGSP	ARTRV/AGSP	A	mao	35
	ARTRV/AGSP	ARTRV/AGSP	B	mao	347
	ARTRV/AGSP	ARTRV/AGSP	BC	mam	856
	ARTRV/AGSP	ARTRV/AGSP	BC	mao	1542
	ARTRV/AGSP	ARTRV/AGSP	C	mam	483
	ARTRV/AGSP	ARTRV/AGSP	C	mao	758
	ARTRV/AGSP	ARTRV/AGSP	CD	mam	259
	ARTRV/ELCI	AGCR Group	CD	hem	0
	ARTRV/ELCI	AGCR Group	CD	mam	2
	ARTRV/ELCI	AGCR Group	D	hed	1
	ARTRV/ELCI	AGCR Group	D	hem	2

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/ELCI	ARTRV/AGCR	CD	mam	80
	ARTRV/ELCI	ARTRV/AGCR	CD	mao	16
	ARTRV/ELCI	ARTRV/ELCI	C	mam	71
	ARTRV/ELCI	ARTRV/ELCI	C	mao	139
	ARTRV/ELCI	ARTRV/POSE	C	mam	38
	ARTRV/ELCI	ARTRV/POSE	C	mao	56
	ARTRV/ELCI	Annual grassland	D	sv	49
	ARTRV/ELCI	ELCI Group	C	hed	10
	ARTRV/ELCI	ELCI Group	C	hem	12
	ARTRV/ELCI	ELCI Group	D	hed	5
	ARTRV/ELCI	ELCI Group	D	hem	15
	ARTRV/ELCI	Perennial grassland, dry pasture	D	hed	3
	ARTRV/ELCI	Perennial grassland, irrigated pasture	D	hed	0
	ARTRV/ELCI	Perennial grassland, irrigated pasture	D	hem	0
	ARTRV/FEID	ARTRV/AGCR	CD	mam	16
	ARTRV/FEID	ARTRV/AGCR	CD	mao	35
	ARTRV/FEID	ARTRV/FEID	A	mam	690
	ARTRV/FEID	ARTRV/FEID	A	mao	732
	ARTRV/FEID	ARTRV/FEID	AB	mam	172
	ARTRV/FEID	ARTRV/FEID	AB	mao	213
	ARTRV/FEID	ARTRV/FEID	B	mam	776
	ARTRV/FEID	ARTRV/FEID	B	mao	455
	ARTRV/FEID	ARTRV/FEID	BC	mam	672
	ARTRV/FEID	ARTRV/FEID	BC	mao	412
	ARTRV/FEID	ARTRV/FEID	C	mam	256
	ARTRV/POSE	AGCR Group	D	hed	11
	ARTRV/POSE	ARTRV/POSE	B	mao	141
	ARTRV/POSE	POSE Group	D	hed	70
	ARTRV/POSE	POSE Group	D	hem	0
	ARTRV/POSE	Perennial grassland, dry pasture	D	hed	2
	ARTRV/POSE	Perennial grassland, dry pasture	D	hem	0
	ARTRV/POSE	Perennial grassland, irrigated pasture	D	hed	2
	ARTRW-CHMI/POSE	ARTRW-CHMI/POSE	B	mam	2034
	ARTRW-CHMI/POSE	Annual grassland	D	sv	2
	Carex Wetland Group	Carex Wetland Group	A	hed	25
	Carex Wetland Group	Carex Wetland Group	A	hem	1
	Carex Wetland Group	Carex Wetland Group	C	hem	25
	Carex Wetland Group	Perennial grassland, dry pasture	D	hed	0

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	Carex Wetland Group	Perennial grassland, dry pasture	D	hem	0
	Exposed bedrock, talus, and scree	Exposed bedrock, talus, and scree	na	sv	719
	FEID Group	FEID Group	A	hed	150
	FEID Group	FEID Group	A	hem	253
	Mountain Shrub Group	Mountain Shrub Group	B	tad	20
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	A	sam	1
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	B	mtm	1
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	mtm	1
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	pom	15
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	C	mtm	15
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	CD	mtm	19
	POTR/BRCA	POTR/POPR	CD	mtm	10
	POTR/SYOR/CARU	POTR/SYOR/CARU	A	sam	0
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	mtm	2
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	pom	62
	POTR/SYOR/CARU	POTR/SYOR/CARU	C	mtm	6
	POTR/SYOR/CARU	POTR/SYOR/CARU	CD	mtm	23
	PSME/CARU, CARU	PSME/CARU, CARU	A	lto	0
	PSME/CARU, CARU	PSME/CARU, CARU	AB	mto	0
	PSME/CARU, CARU	PSME/CARU, CARU	B	mto	0
	PSME/CARU, CARU	PSME/CARU, CARU	BC	mto	0
	PSME/FEID, FEID	PSME/FEID, FEID	A	mtm	0
	PSME/FEID, FEID	PSME/FEID, FEID	B	mto	0
	SAGE/CAUT	SAGE/CAUT	BC	tad	4
	Unclassified vegetation	Unclassified vegetation	na	na	1
	Undifferentiated riparian vegetation	Undifferentiated riparian vegetation	na	na	129
	Water	Water	na	na	0

B. BISKAY

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
Private	ARAR/AGSP	ARAR/AGSP	A	Iso	13
	ARAR/AGSP	ARAR/AGSP	B	Iso	62
	ARAR/FEID	ARAR/FEID	A	Iso	236
	ARAR/FEID	ARAR/FEID	B	Iso	41
	ARAR/POSE	ARAR/POSE	A	Iso	388
	ARAR/POSE	Annual grassland	D	sv	1
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	AB	mam	6
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	B	mao	126
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	BC	mam	92
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	A	mao	52
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	AB	mam	333
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	B	mam	27
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	BC	mam	42
	ARTRV/AGSP	AGSP Group	A	hem	1
	ARTRV/AGSP	AGSP Group	B	hem	30
	ARTRV/AGSP	AGSP Group	CD	hed	95
	ARTRV/AGSP	ARTRV/AGSP	A	mam	17
	ARTRV/AGSP	ARTRV/AGSP	A	mao	33
	ARTRV/AGSP	ARTRV/AGSP	B	mao	170
	ARTRV/AGSP	ARTRV/AGSP	BC	mam	257
	ARTRV/AGSP	ARTRV/AGSP	BC	mao	638
	ARTRV/AGSP	ARTRV/AGSP	C	mam	123
	ARTRV/AGSP	ARTRV/AGSP	C	mao	112
	ARTRV/AGSP	ARTRV/AGSP	CD	mam	30
	ARTRV/ELCI	ARTRV/AGCR	CD	mam	14
	ARTRV/ELCI	ARTRV/ELCI	C	mam	51
	ARTRV/ELCI	ARTRV/ELCI	C	mao	293
	ARTRV/ELCI	ARTRV/POSE	C	mam	24
	ARTRV/ELCI	ARTRV/POSE	C	mao	52
	ARTRV/ELCI	Annual grassland	D	sv	11
	ARTRV/ELCI	ELCI Group	C	hed	8
	ARTRV/ELCI	ELCI Group	D	hed	29
	ARTRV/ELCI	ELCI Group	D	hem	16
	ARTRV/FEID	ARTRV/FEID	A	mam	392
	ARTRV/FEID	ARTRV/FEID	A	mao	459
	ARTRV/FEID	ARTRV/FEID	AB	mam	92
	ARTRV/FEID	ARTRV/FEID	AB	mao	155
	ARTRV/FEID	ARTRV/FEID	B	mam	292

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/FEID	ARTRV/FEID	B	mao	331
	ARTRV/FEID	ARTRV/FEID	BC	mam	162
	ARTRV/FEID	ARTRV/FEID	BC	mao	277
	ARTRV/FEID	ARTRV/FEID	C	mam	33
	ARTRV/POSE	ARTRV/POSE	B	mao	3
	ARTRV/POSE	POSE Group	D	hed	37
	ARTRV/POSE	POSE Group	D	hem	11
	ARTRV/POSE	POSE Group	D	heo	0
	ARTRW-CHMI/POSE	ARTRW-CHMI/POSE	B	mam	2
	ARTRW-CHMI/POSE	Annual grassland	D	sv	0
	Carex Wetland Group	Carex Wetland Group	A	hed	12
	Carex Wetland Group	Carex Wetland Group	A	hem	0
	Carex Wetland Group	Carex Wetland Group	C	hem	19
	Exposed bedrock, talus, and scree	Exposed bedrock, talus, and scree	na	sv	99
	FEID Group	FEID Group	A	hed	82
	FEID Group	FEID Group	A	hem	40
	Mountain Shrub Group	Mountain Shrub Group	B	tad	18
	PIFL/FEID	PSME-PIFL/FEID	A	ltm	0
	PIFL/FEID	PSME-PIFL/FEID	A	mtm	7
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	B	mtm	0
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	mtm	5
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	pom	4
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	C	mtm	39
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	CD	mtm	15
	POTR/BRCA	POTR/POPR	CD	mtm	18
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	mtm	5
	POTR/SYOR/CARU	POTR/SYOR/CARU	C	mtm	11
	POTR/SYOR/CARU	POTR/SYOR/CARU	CD	mtm	19
	PSME/CARU, CARU	PSME/CARU, CARU	A	ltm	2
	PSME/CARU, CARU	PSME/CARU, CARU	A	lto	19
	PSME/CARU, CARU	PSME/CARU, CARU	A	mtm	32
	PSME/CARU, CARU	PSME/CARU, CARU	AB	mto	18
	PSME/CARU, CARU	PSME/CARU, CARU	B	mto	44
	PSME/CARU, CARU	PSME/CARU, CARU	BC	mto	57
	PSME/FEID, FEID	PSME/FEID, FEID	A	ltm	19
	PSME/FEID, FEID	PSME/FEID, FEID	A	lto	3
	PSME/FEID, FEID	PSME/FEID, FEID	A	mtm	75
	PSME/FEID, FEID	PSME/FEID, FEID	AB	mto	4
	PSME/FEID, FEID	PSME/FEID, FEID	B	mto	27
	PSME/SYOR	PSME/SYOR	AB	mto	0

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	PSME/SYOR	PSME/SYOR	B	mto	5
	SAGE/CAUT	SAGE/CAUT	BC	tad	21
	Unclassified vegetation	Unclassified vegetation	na	na	1
	Undifferentiated riparian vegetation	Undifferentiated riparian vegetation	na	na	437
Public	ARAR/AGSP	ARAR/AGSP	A	lso	122
	ARAR/AGSP	ARAR/AGSP	B	lso	303
	ARAR/FEID	ARAR/FEID	A	lso	626
	ARAR/FEID	ARAR/FEID	B	lso	179
	ARAR/POSE	ARAR/POSE	A	lso	907
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	AB	mam	64
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	B	mao	239
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	BC	mam	273
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	A	mao	62
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	AB	mam	693
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	B	mam	294
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	BC	mam	169
	ARTRV/AGSP	AGSP Group	A	hem	26
	ARTRV/AGSP	AGSP Group	B	hem	83
	ARTRV/AGSP	AGSP Group	CD	hed	137
	ARTRV/AGSP	ARTRV/AGSP	A	mam	107
	ARTRV/AGSP	ARTRV/AGSP	A	mao	72
	ARTRV/AGSP	ARTRV/AGSP	B	mao	391
	ARTRV/AGSP	ARTRV/AGSP	BC	mam	486
	ARTRV/AGSP	ARTRV/AGSP	BC	mao	1102
	ARTRV/AGSP	ARTRV/AGSP	C	mam	82
	ARTRV/AGSP	ARTRV/AGSP	C	mao	175
	ARTRV/AGSP	ARTRV/AGSP	CD	mam	36
	ARTRV/ELCI	ARTRV/AGCR	CD	mam	1
	ARTRV/ELCI	ARTRV/ELCI	C	mam	11
	ARTRV/ELCI	ARTRV/ELCI	C	mao	22
	ARTRV/ELCI	ARTRV/POSE	C	mam	5
	ARTRV/ELCI	ARTRV/POSE	C	mao	4
	ARTRV/ELCI	Annual grassland	D	sv	0
	ARTRV/ELCI	ELCI Group	C	hed	1
	ARTRV/ELCI	ELCI Group	D	hed	4
	ARTRV/ELCI	ELCI Group	D	hem	2
	ARTRV/FEID	ARTRV/FEID	A	mam	973
	ARTRV/FEID	ARTRV/FEID	A	mao	1125
	ARTRV/FEID	ARTRV/FEID	AB	mam	214
	ARTRV/FEID	ARTRV/FEID	AB	mao	356

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/FEID	ARTRV/FEID	B	mam	383
	ARTRV/FEID	ARTRV/FEID	B	mao	385
	ARTRV/FEID	ARTRV/FEID	BC	mam	268
	ARTRV/FEID	ARTRV/FEID	BC	mao	247
	ARTRV/FEID	ARTRV/FEID	C	mam	63
	ARTRV/POSE	ARTRV/POSE	B	mao	2
	ARTRV/POSE	POSE Group	D	hed	5
	ARTRV/POSE	POSE Group	D	hem	0
	ARTRW-CHMI/POSE	ARTRW-CHMI/POSE	B	mam	0
	Carex Wetland Group	Carex Wetland Group	A	hed	31
	Carex Wetland Group	Carex Wetland Group	C	hem	2
	Exposed bedrock, talus, and scree	Exposed bedrock, talus, and scree	na	sv	163
	FEID Group	FEID Group	A	hed	275
	FEID Group	FEID Group	A	hem	126
	Mountain Shrub Group	Mountain Shrub Group	B	tad	89
	PIFL/FEID	PIFL/FEID	A	lto	10
	PIFL/FEID	PSME-PIFL/FEID	A	ltm	29
	PIFL/FEID	PSME-PIFL/FEID	A	mtm	181
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	A	sam	0
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	B	mtm	2
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	mtm	27
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	pom	7
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	C	mtm	2
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	CD	mtm	34
	POTR/BRCA	POTR/POPR	CD	mtm	13
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	mtm	22
	POTR/SYOR/CARU	POTR/SYOR/CARU	C	mtm	1
	POTR/SYOR/CARU	POTR/SYOR/CARU	CD	mtm	12
	PSME/CARU, CARU	PSME/CARU, CARU	A	ltm	31
	PSME/CARU, CARU	PSME/CARU, CARU	A	lto	48
	PSME/CARU, CARU	PSME/CARU, CARU	A	mtm	113
	PSME/CARU, CARU	PSME/CARU, CARU	AB	mto	56
	PSME/CARU, CARU	PSME/CARU, CARU	B	mto	67
	PSME/CARU, CARU	PSME/CARU, CARU	BC	mto	66
	PSME/FEID, FEID	PSME/FEID, FEID	A	ltm	53
	PSME/FEID, FEID	PSME/FEID, FEID	A	lto	26
	PSME/FEID, FEID	PSME/FEID, FEID	A	mtm	194
	PSME/FEID, FEID	PSME/FEID, FEID	AB	mto	39
	PSME/FEID, FEID	PSME/FEID, FEID	B	mto	104
	PSME/SYOR	PSME/SYOR	A	ltm	1

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	PSME/SYOR	PSME/SYOR	A	lto	12
	PSME/SYOR	PSME/SYOR	A	mtm	0
	PSME/SYOR	PSME/SYOR	AB	mto	10
	PSME/SYOR	PSME/SYOR	B	mto	49
	SAGE/CAUT	SAGE/CAUT	BC	tad	32
	Unclassified vegetation	Unclassified vegetation	na	na	1
	Undifferentiated riparian vegetation	Undifferentiated riparian vegetation	na	na	155

C. MULDOON

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
Private	ARAR/AGSP	ARAR/AGSP	A	Iso	1
	ARAR/AGSP	ARAR/AGSP	B	Iso	6
	ARAR/FEID	ARAR/FEID	A	Iso	46
	ARAR/FEID	ARAR/FEID	B	Iso	5
	ARAR/POSE	ARAR/POSE	A	Iso	205
	ARAR/POSE	Annual grassland	D	sv	0
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	AB	mam	5
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	B	mao	12
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	BC	mam	28
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	A	mao	1
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	AB	mam	178
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	B	mam	15
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	BC	mam	29
	ARTRV/AGSP	AGSP Group	B	hem	0
	ARTRV/AGSP	AGSP Group	CD	hed	37
	ARTRV/AGSP	ARTRV/AGSP	A	mam	3
	ARTRV/AGSP	ARTRV/AGSP	B	mao	18
	ARTRV/AGSP	ARTRV/AGSP	BC	mam	57
	ARTRV/AGSP	ARTRV/AGSP	BC	mao	283
	ARTRV/AGSP	ARTRV/AGSP	C	mam	91
	ARTRV/AGSP	ARTRV/AGSP	C	mao	80
	ARTRV/AGSP	ARTRV/AGSP	CD	mam	11
	ARTRV/ELCI	ARTRV/AGCR	CD	mam	0
	ARTRV/ELCI	ARTRV/ELCI	C	mam	20
	ARTRV/ELCI	ARTRV/ELCI	C	mao	134
	ARTRV/ELCI	ARTRV/POSE	C	mam	9
	ARTRV/ELCI	ARTRV/POSE	C	mao	2
	ARTRV/ELCI	Annual grassland	D	sv	2
	ARTRV/ELCI	ELCI Group	C	hed	2
	ARTRV/ELCI	ELCI Group	D	hed	8
	ARTRV/ELCI	ELCI Group	D	hem	2
	ARTRV/FEID	ARTRV/FEID	A	mam	68
	ARTRV/FEID	ARTRV/FEID	A	mao	129
	ARTRV/FEID	ARTRV/FEID	AB	mam	9
	ARTRV/FEID	ARTRV/FEID	AB	mao	96
	ARTRV/FEID	ARTRV/FEID	B	mam	177
	ARTRV/FEID	ARTRV/FEID	B	mao	87
	ARTRV/FEID	ARTRV/FEID	BC	mam	184

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/FEID	ARTRV/FEID	BC	mao	249
	ARTRV/FEID	ARTRV/FEID	C	mam	21
	ARTRV/POSE	ARTRV/POSE	B	mao	3
	ARTRV/POSE	POSE Group	D	hed	4
	ARTRV/POSE	POSE Group	D	hem	2
	ARTRW-CHMI/POSE	ARTRW-CHMI/POSE	B	mam	0
	Carex Wetland Group	Carex Wetland Group	A	hed	1
	Carex Wetland Group	Carex Wetland Group	C	hem	17
	Exposed bedrock, talus, and scree	Exposed bedrock, talus, and scree	na	sv	84
	FEID Group	FEID Group	A	hed	47
	FEID Group	FEID Group	A	hem	1
	Mountain Shrub Group	Mountain Shrub Group	B	tad	10
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	B	mtm	0
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	mtm	5
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	C	mtm	36
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	CD	mtm	0
	POTR/BRCA	POTR/POPR	CD	mtm	4
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	mtm	2
	POTR/SYOR/CARU	POTR/SYOR/CARU	C	mtm	13
	POTR/SYOR/CARU	POTR/SYOR/CARU	CD	mtm	5
	PSME/CARU, CARU	PSME/CARU, CARU	AB	mto	0
	PSME/FEID, FEID	PSME/FEID, FEID	AB	mto	0
	SAGE/CAUT	SAGE/CAUT	BC	tad	1
	Undifferentiated riparian vegetation	Undifferentiated riparian vegetation	na	na	462
Public	ARAR/AGSP	ARAR/AGSP	A	lso	51
	ARAR/AGSP	ARAR/AGSP	B	lso	142
	ARAR/FEID	ARAR/FEID	A	lso	290
	ARAR/FEID	ARAR/FEID	B	lso	49
	ARAR/POSE	ARAR/POSE	A	lso	778
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	AB	mam	26
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	B	mao	70
	ARTRV-SYOR/AGSP	ARTRV-SYOR/AGSP	BC	mam	230
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	A	mao	14
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	AB	mam	533
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	B	mam	92
	ARTRV-SYOR/FEID	ARTRV-SYOR/FEID	BC	mam	73
	ARTRV/AGSP	AGSP Group	A	hem	10
	ARTRV/AGSP	AGSP Group	B	hem	6
	ARTRV/AGSP	AGSP Group	CD	hed	134
	ARTRV/AGSP	ARTRV/AGSP	A	mam	82

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	ARTRV/AGSP	ARTRV/AGSP	A	mao	26
	ARTRV/AGSP	ARTRV/AGSP	B	mao	159
	ARTRV/AGSP	ARTRV/AGSP	BC	mam	512
	ARTRV/AGSP	ARTRV/AGSP	BC	mao	986
	ARTRV/AGSP	ARTRV/AGSP	C	mam	293
	ARTRV/AGSP	ARTRV/AGSP	C	mao	316
	ARTRV/AGSP	ARTRV/AGSP	CD	mam	9
	ARTRV/ELCI	ARTRV/AGCR	CD	mam	1
	ARTRV/ELCI	ARTRV/ELCI	C	mam	7
	ARTRV/ELCI	ARTRV/ELCI	C	mao	114
	ARTRV/ELCI	ARTRV/POSE	C	mam	3
	ARTRV/ELCI	ARTRV/POSE	C	mao	2
	ARTRV/ELCI	Annual grassland	D	sv	2
	ARTRV/ELCI	ELCI Group	C	hed	1
	ARTRV/ELCI	ELCI Group	D	hed	14
	ARTRV/ELCI	ELCI Group	D	hem	16
	ARTRV/FEID	ARTRV/FEID	A	mam	728
	ARTRV/FEID	ARTRV/FEID	A	mao	831
	ARTRV/FEID	ARTRV/FEID	AB	mam	79
	ARTRV/FEID	ARTRV/FEID	AB	mao	382
	ARTRV/FEID	ARTRV/FEID	B	mam	423
	ARTRV/FEID	ARTRV/FEID	B	mao	447
	ARTRV/FEID	ARTRV/FEID	BC	mam	397
	ARTRV/FEID	ARTRV/FEID	BC	mao	354
	ARTRV/FEID	ARTRV/FEID	C	mam	56
	ARTRV/POSE	ARTRV/POSE	B	mao	15
	ARTRV/POSE	POSE Group	D	hed	2
	ARTRV/POSE	POSE Group	D	hem	0
	ARTRV/POSE	POSE Group	D	heo	3
	ARTRW-CHMI/POSE	ARTRW-CHMI/POSE	B	mam	0
	Carex Wetland Group	Carex Wetland Group	A	hed	16
	Carex Wetland Group	Carex Wetland Group	C	hem	6
	Exposed bedrock, talus, and scree	Exposed bedrock, talus, and scree	na	sv	160
	FEID Group	FEID Group	A	hed	325
	FEID Group	FEID Group	A	hem	46
	Mountain Shrub Group	Mountain Shrub Group	B	tad	89
	PIFL/FEID	PSME-PIFL/FEID	A	ltm	5
	PIFL/FEID	PSME-PIFL/FEID	A	mtm	49
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	B	mtm	5
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	BC	mtm	83

Owner ship	Association Code/Map Unit	Cover class	Ecological Condition	Structural class	Acres
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	C	mtm	51
	POTR/AMAL-SYOR/BRCA	POTR/AMAL-SYOR/BRCA	CD	mtm	11
	POTR/BRCA	POTR/POPR	CD	mtm	11
	POTR/SYOR/CARU	POTR/SYOR/CARU	A	sam	1
	POTR/SYOR/CARU	POTR/SYOR/CARU	BC	mtm	21
	POTR/SYOR/CARU	POTR/SYOR/CARU	C	mtm	13
	POTR/SYOR/CARU	POTR/SYOR/CARU	CD	mtm	8
	PSME/CARU, CARU	PSME/CARU, CARU	A	ltm	1
	PSME/CARU, CARU	PSME/CARU, CARU	A	lto	13
	PSME/CARU, CARU	PSME/CARU, CARU	A	mtm	29
	PSME/CARU, CARU	PSME/CARU, CARU	AB	mto	24
	PSME/CARU, CARU	PSME/CARU, CARU	B	mto	25
	PSME/CARU, CARU	PSME/CARU, CARU	BC	mto	31
	PSME/FEID, FEID	PSME/FEID, FEID	A	ltm	7
	PSME/FEID, FEID	PSME/FEID, FEID	A	lto	7
	PSME/FEID, FEID	PSME/FEID, FEID	A	mtm	68
	PSME/FEID, FEID	PSME/FEID, FEID	AB	mto	16
	PSME/FEID, FEID	PSME/FEID, FEID	B	mto	71
	PSME/SYOR	PSME/SYOR	A	lto	1
	PSME/SYOR	PSME/SYOR	A	mtm	0
	PSME/SYOR	PSME/SYOR	AB	mto	0
	PSME/SYOR	PSME/SYOR	B	mto	5
	SAGE/CAUT	SAGE/CAUT	BC	tad	33
	Unclassified vegetation	Unclassified vegetation	na	na	0
	Undifferentiated riparian vegetation	Undifferentiated riparian vegetation	na	na	291

Table 4. Summary of exemplary vegetation within the Pioneer Mountain Ranch study area. The total acreage of plant community element occurrences with element occurrence rank A or AB is listed by plant association and element occurrence type.

Plant Association	Element Occurrence Type	Size (acres)
ARAR/AGSP	late-seral	473.0
ARAR/FEID	late-seral	1,332.4
ARAR/POSE	late-seral	3,171.3
ARTH/FEID	late-seral	13.3
ARTRV-SYOR/AGSP	late-seral	44.7
ARTRV-SYOR/FEID	late-seral	860.4
ARTRV/AGSP	mid-seral	110.3
	late-seral	413.1
ARTRV/FEID	late-seral	5,773.5
Carex Wetland Group	late-seral	32.0
FEID Group	late-seral	771.2
PIFL/FEID	mid-seral, large tree	290.4
POTR/SYOR/CARU	mid-seral, large tree	1.3
PSME/CARU_CARU	mid-seral, large tree	297.7
PSME/FEID_FEID	mid-seral, large tree	472.4
PSME/SYOR	mid-seral, large tree	61.2

Table 5. Summary of noxious weed occurrence data. Noxious weed occurrences are listed by species and occurrence number. The population location is given with one to many UTM coordinates. Multiple coordinates are used to indicate the bounds of larger occurrences. Date of observation and estimated population size are also shown.

Species	#	Location	UTM X	UTM Y	Date	Pop size
<i>Centaurea diffusa</i>	1	Cummingham Canyon road; T02N/R23E, S18	276105	4821102	7/6/2001	5
<i>Centaurea diffusa</i>	2	lower Cottonwood Creek (just below bridge); T02N/R24E, S31	286532	4815874	7/10/2001	
<i>Centaurea diffusa</i>	3	southeast slopes of Pioneer Mountains; T01N/R24E, S08	286952	4811355	7/11/2001	
<i>Centaurea diffusa</i>	4	southeast slopes of Pioneer Mountains; T01N/R24E, S19	286600	4808490	7/18/2001	
<i>Centaurea diffusa</i>	5	Copper Creek Road; T01N/R23E, S21,16	279910	4809810	7/19/2001	
			279529	4810228	7/19/2001	
<i>Centaurea diffusa</i>	6	north of Lava Lake; T01N/R23E; S28	279750	4807412	7/24/2001	1000
			279643	4807853	7/24/2001	
<i>Centaurea diffusa</i>	7	upper Cottonwood Creek, near Paymaster Mine building site; T02N/R23E, S25	285313	4817505	8/2/2001	8
<i>Centaurea diffusa</i>	8	lower eastern tributary of upper Fish Creek; T03N/R23E, S33	280568	4825316	8/9/2001	1 (pulled)
<i>Centaurea diffusa</i>	9	middle eastern tributary of upper Fish Creek; T03/R23E, S28	280837	4826085	8/14/2001	2 (pulled)
<i>Centaurea diffusa</i>	10	middle eastern tributary of upper Fish Creek; T03/R23E, S27	280898	4825933	8/14/2001	60
<i>Centaurea diffusa</i>	11	middle eastern tributary of upper Fish Creek; T03/R23E, S34	280977	4825807	8/14/2001	14 (some pulled)
<i>Centaurea diffusa</i>	12	middle eastern tributary of upper Fish Creek; T03/R23E, S33	280794	4825768	8/14/2001	1
<i>Centaurea diffusa</i>	13	Cottonwood Creek; T02N/R24E, S30	285924	4816809	8/29/2001	300-500
			286093	4816666	8/29/2001	
			286160	4816617	8/29/2001	
			286320	4816460	8/29/2001	
<i>Centaurea diffusa</i>	14	lower Cottonwood Creek (just below bridge); T02N/R24E, S31	286517	4816158	8/29/2001	150 (approximate)
			286520	4815924	8/29/2001	
			286535	4815879	8/29/2001	
			286539	4815605	8/29/2001	
<i>Centaurea diffusa</i>	15	Copper Creek; T01N/R23E, S03	280543	4813308	8/29/2001	2

Species	#	Location	UTM X	UTM Y	Date	Pop size
Centaurea diffusa	16	north of Lava Lake; T01N/R23E; S28	279651	4807834	8/29/2001	1000's
			279531	4807870	8/29/2001	
			279464	4808022	8/29/2001	
			279607	4808113	8/29/2001	
Centaurea diffusa	17	Cottonwood Creek Road (just north of Hwy 20); T01N/R24E, S08	287942	4812366	8/29/2001	1
Centaurea diffusa	18	Copper Creek; T01N/R23E, S09, 10, 03	279861	4811924	8/29/2001	150 approximately
			279857	4811909	8/29/2001	
			279954	4812156	8/29/2001	
			279984	4812441	8/29/2001	
			280583	4813291	8/29/2001	
Centaurea diffusa	19	Iron Mine Creek; T02N/R23E, S10	282194	4821960	8/31/2001	1 (pulled)
Centaurea diffusa	20	Iron Mine Creek; T02N/R23E, S04	279999	4823138	8/31/2001	1 (pulled)
Centaurea maculosa	1	north of Lava Lake; T01N/R23E; S28	279750	4807412	7/24/2001	1000
			279643	4807853	7/24/2001	
Centaurea maculosa	2	lower eastern tributary of upper Fish Creek; T03N/R23E, S33	280269	4825488	8/9/2001	1 (pulled)
Centaurea maculosa	3	middle eastern tributary of upper Fish Creek; T03/R23E, S27	281058	4826151	8/14/2001	1 (pulled)
Centaurea maculosa	4	middle eastern tributary of upper Fish Creek; T03/R23E, S27	280898	4825933	8/14/2001	12
Centaurea maculosa	5	north of Lava Lake; T01N/R23E; S28	279651	4807834	8/29/2001	1000's
			279531	4807870	8/29/2001	
			279464	4808022	8/29/2001	
			279607	4808113	8/29/2001	
Centaurea maculosa	6	Cottonwood Creek Road (just north of Hwy 20); T01N/R24E, S08	287942	4812366	8/29/2001	38
Centaurea maculosa	7	Copper Creek; T01N/R23E, S09, 10, 03	279861	4811924	8/29/2001	150 approximately
			279857	4811909	8/29/2001	
			279954	4812156	8/29/2001	
			279984	4812441	8/29/2001	
			280583	4813291	8/29/2001	
Centaurea maculosa	8	south of Lava Lake, on shoulder of Hwy 20; T01N/R23E; S33	0	0	6/27/2001	100
Cirsium arvense	1	southeast slopes of Pioneer Mountains; T01N/R24E, S08	286144	4808859	7/18/2001	10

Species	#	Location	UTM X	UTM Y	Date	Pop size
Cirsium arvense	2	upper eastern tributary of upper Fish Creek; T03/R23E, S28	280866	4827733	8/9/2001	9
Cirsium arvense	3	upper Cottonwood Creek; T02N/R24E, S30	285461	4817412	8/29/2001	300
			285440	4817403	8/29/2001	
			285480	4817317	8/29/2001	
			285510	4817344	8/29/2001	
Cirsium arvense	4	Cottonwood Creek; T02N/R24E, S30	286093	4816666	8/29/2001	50-100
Cirsium arvense	5	Cottonwood Creek (at the bridge); T02N/R24E, S30	286540	4816209	8/29/2001	200-300
			286550	4816164	8/29/2001	
			286517	4816158	8/29/2001	
Cirsium arvense	6	Copper Creek; T01N/R23E, S03	280543	4813308	8/29/2001	200-300
Cirsium arvense	7	Cottonwood Creek Road; T02N/R24E, S31	286431	4815426	8/29/2001	7
Cirsium arvense	8	Iron Mine Creek; T02N/R23E, S10	280838	4822503	8/31/2001	too numerous to count
			281709	4822559	8/31/2001	
Onopordum acanthium	1	Fish Creek Road; T02N/R23E, S06	277058	4824047	7/12/2001	12
Onopordum acanthium	2	Fish Creek Road; T02N/R23E, S05	277692	4824258	8/9/2001	1
Onopordum acanthium	3	Riley/Walton canyons divide; Fish Creek Road; T03N/R23E, S31	276875	4825963	7/20/2001	5
Sonchus arvensis	1	Cottonwood Creek; T02N/R24E, S30	285461	4817412	8/29/2001	300
			285440	4817403	8/29/2001	
			285480	4817317	8/29/2001	
			285510	4817344	8/29/2001	
Sonchus arvensis	2	Cottonwood Creek (at the bridge); T02N/R24E, S30	286540	4816209	8/29/2001	200-300
			286550	4816164	8/29/2001	
			286517	4816158	8/29/2001	

Table 5. Summary of wildlife pellet counts. A) The mean number of pellet groups per acre is summarized by plant association (using vegetation mapping units) and species. B) The number of pellet count observations is shown by species and plant association.

A.

Vegetation mapping unit	Antelope /Deer	Cow	Elk	Grouse	Rabbit	Sage grouse	Sheep
ARAR/AGSP	37.62		173.97	17.41	39.60		
ARAR/FEID	59.44	156.32	60.03			83.13	
ARAR/POSE	48.76	59.78	110.38	23.76		12.86	
ARTRV-SYOR/AGSP	60.02	130.71	83.82				
ARTRV-SYOR/FEID	282.88	229.78	74.32	17.24			138.33
ARTRV/AGSP	103.65	292.07	56.30		36.35	7.33	94.01
ARTRV/ELCI	475.24	182.55	46.53				
ARTRV/FEID	166.06	112.65	73.78	30.43	107.12	20.06	135.36
ARTRV/POSE	245.54	226.13	73.11		22.00		
FEID WG			31.68				
POTR/AMAL-SYOR/BRCA		63.36					
POTR/BRCA	1616.41		923.66				2078.24
POTR/SYOR/CARU		177.18					
PSME/CARU, CARU	58.90		131.24		19.80		
PSME/SYOR	47.67	22.00	47.67				

Table 5. Summary of wildlife pellet counts (continued).

B.

Vegetation mapping unit	Antelope /Deer	Cow	Elk	Grouse	Rabbit	Sage grouse	Sheep
ARAR/AGSP	3		2	1	1		
ARAR/FEID	11	6	14			3	
ARAR/POSE	9	8	14	2		2	
ARTRV-SYOR/AGSP	6	3	2				
ARTRV-SYOR/FEID	16	5	14	2			5
ARTRV/AGSP	25	17	24		4	1	5
ARTRV/ELCI	2	3	2				
ARTRV/FEID	34	21	32	3	3	4	12
ARTRV/POSE	3	11	9		2		
FEID WG			1				
POTR/AMAL-SYOR/BRCA		1					
POTR/BRCA	2		1				1
POTR/SYOR/CARU		2					
PSME/CARU, CARU	4		7		1		
PSME/SYOR	4	2	4				

Appendix 1. Field forms and associated data dictionaries utilized in terrestrial descriptive work are reproduced in the following order:

1. Vegetation Point Observation Form.
2. Vegetation Point Observation Form - Data Dictionary.
3. Ecology Plot Card.
4. Ecology Plot Card Data Dictionary.

VEGETATION POINT OBSERVATION FORM

REV 9/28/98

Site Name _____ Date _____
 Observers _____

Plot ID _____

Plant Association _____
 NVC Subgroup _____
 NVC Community Association _____
 Structural Condition _____ Seral Status _____

Latitude _____ Longitude _____ Way Point _____ FOM _____

SLOPE _____ MICRO VERTICAL _____
 ASPECT _____ MICRO HORIZONTAL _____
 ELEVATION _____ TOPO MOISTURE _____

ECOLOGICAL CONDITION: _____ COMMENTS: _____

DISTRIBUTION PATTERN: _____

COMPOSITION COMMENTS: _____

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Plot ID _____

Plant Association _____
 NVC Subgroup _____
 NVC Community Association _____
 Structural Condition _____ Seral Status _____

Latitude _____ Longitude _____ Way Point _____ FOM _____

SLOPE _____ MICRO VERTICAL _____
 ASPECT _____ MICRO HORIZONTAL _____
 ELEVATION _____ TOPO MOISTURE _____

ECOLOGICAL CONDITION: _____ COMMENTS: _____

DISTRIBUTION PATTERN: _____

COMPOSITION COMMENTS: _____

Plot ID _____

Plant Association _____
 NVC Subgroup _____
 NVC Community Association _____
 Structural Condition _____ Seral Status _____

Latitude _____ Longitude _____ Way Point _____ FOM _____

SLOPE _____ MICRO VERTICAL _____
 ASPECT _____ MICRO HORIZONTAL _____
 ELEVATION _____ TOPO MOISTURE _____

ECOLOGICAL CONDITION: _____ COMMENTS: _____

DISTRIBUTION PATTERN: _____

COMPOSITION COMMENTS: _____

-----<+>-----

Plot ID _____

Plant Association _____
 NVC Subgroup _____
 NVC Community Association _____
 Structural Condition _____ Seral Status _____

Latitude _____ Longitude _____ Way Point _____ FOM _____

SLOPE _____ MICRO VERTICAL _____
 ASPECT _____ MICRO HORIZONTAL _____
 ELEVATION _____ TOPO MOISTURE _____

ECOLOGICAL CONDITION: _____ COMMENTS: _____

DISTRIBUTION PATTERN: _____

COMPOSITION COMMENTS: _____

VEGETATION POINT OBSERVATION FORM - DATA DICTIONARY

Introduction. Plant community point observations are intended to rapidly build information on patterns in the distribution and condition of plant associations. Point observations may be taken in conjunction with other ecology plots methods.

On a walking route through the study area, data on the plant association present, stand level ecological condition and seral status, and the physical environment are repeatedly collected. New data is collected as a new plant association is encountered or with any significant change in the environmental parameters (slope, aspect, elevation), structural condition, seral status, or ecological condition. While *en route* through the study area, narrative descriptions will usually stabilize. Rather than re-describing similar observations, earlier descriptions should be referenced and embellished upon. Information, however, on structural condition, seral status, and the environmental parameters of slope, aspect, and elevation should be recorded at each and every opportunity.

Field	Value	Description (range of values)
Aspect	range	0 - 360 °; declination-corrected azimuth of slope aspect to the nearest degree.
Composition Comments	narrative	Description of the abundance of important (common or rare) species within the stand, substrate cover (bedrock, boulders, stones, cobbles, gravel, and soil), outstanding floristic features, or notable compositional peculiarities (i.e., with respect to the plant association).
Date	date	MM/DD/YY (month/day/year).
Distribution Pattern	narrative	Description of the size and placement of the stand in relation to adjacent stands and key environmental factors. Examples: a) extensive on this and adjacent slope aspects; b) occurs on small inclusions of deeper soil within a mosaic dominated by ARAR/AGSP on shallow soils; or c) restricted to lower slope positions with northerly aspects.
Ecological Condition	A	Pristine condition. Evidence of post-industrial human-caused disturbance is absent. Exotic species are absent.
	B	Little evidence of post-industrial human-caused disturbance is present. Stand composition and structure is predominantly natural. Exotic species are only common (\leq one percent cover).
	C	Post-industrial human-caused disturbance is apparent. Stand composition and structure is altered. Exotic species are well represented to abundant (5 - 25 percent cover).
	D	Evidence of post-industrial human-caused disturbance is prevalent. Stand composition and structure is altered. Native species are present, but are in peril of loss. Increasers dominate the stand. Invader species are a significant compositional component.
	F	Native stand composition, structure, and function are significantly altered. Re-establishment of native stand composition, structure, and function will require large energy inputs.
Ecological Condition; Comments	narrative	Identification and description of factors contributing to the assignment of ecological condition rank. These comments should help refine the rationale and criteria used in assessing the ecological condition of the association in question.
Elevation	range	0 - 25000; elevation in feet.
Latitude	range	Latitude in degrees and minutes (to three decimal places)
Longitude	range	Longitude in degrees and minutes (to three decimal places)
Micro Vertical, Micro Horizontal	1	Convex
	2	Straight
	3	Concave

	4	Undulating
NVC Subgroup	name	National Vegetation Classification subgroup (e.g., evergreen forest).
NVC Community Association	name	The physiognomically uniform existing vegetation named for the diagnostic (dominant, differential, indicator, or character) overstory and understory species.
Observers	name	The names of those observing the information recorded.
Plant Association	name	The name of the potential natural community as identified through the use of recognized authoritative field guides or classification keys.
Plot Id	alphanumeric	The plot identification is indicated as an eleven character alphanumeric string incorporating the current date and time (using the twenty-four hour clock) as follows: (date-time) YYMMDD-HHMM. The standard WHTF method may also be used.
Seral Status	PNC	The potential natural community; seral species are scarce to absent. Species composition and density are relatively stable. The dominant species are reproducing.
	late	Late-seral species are well represented to abundant and increasing in abundance. Seral species may still persist.
	mid	Late-seral species are well represented to abundant in the understory and are beginning to occupy the overstory or are present with low density and abundance.
	early	Seral species are dominant in the overstory or late-seral species are present with low density and abundance or absent.
	retro	Native species are either absent or so low in abundance as to make recolonization very difficult. Increasers and invaders dominate. The vegetation is disclimax. Only mechanical manipulation will result in the reintroduction of native late-seral species.
Site Name	name	The name of the site. Each site is assigned a unique name. Once assigned, the name should not change unless absolutely necessary. The following conventions are applied: 1) local place names are used first when available, 2) names of features on topographic maps are used when local names do not exist, and 3) no two sites within the state are given the same name.
Slope	range	0 - 360 °; inclination of the surface of the soil from the horizontal.
Structural Condition		<u>Shrubland, Herbland, and Grassland PNV</u> : Five character string incorporating code for height, canopy cover, and canopy layering (strata).
Height classes:	HE	Herbland. Grasses and herbs are the only life form present.
	LS	Low shrub. Shrubs are 0 - 1.5 feet tall.
	Ma	Medium shrub. Shrubs are 1.6 - 2.5 feet tall.
	Mb	Medium tall shrub. Shrubs are 2.6 - 4.0 feet tall.
	Ta	Tall shrub. Shrubs are 4 - 6.5 feet tall.
Cover classes:	Tb	Very tall shrub. Shrubs are ≥ 6.5 (and < 16.5) feet tall.
	Na	< 10 percent canopy cover.
	Oa	≥ 10 and < 15 percent canopy cover.
	Ob	≥ 15 and ≤ 25 percent canopy cover.
	Ma	> 25 and ≤ 40 percent canopy cover.
Shrub strata	Mb	> 40 and ≤ 66 percent canopy cover.
	Da	> 66 percent cover.
	N	No strata.
	E	One stratum with < 30 percent difference in height.
	U	Two or more strata (of the same life form) with > 30 percent difference in height. If shrubland, a second shrub strata must have ≥ 25 percent cover. If herbland or grassland, a second herb or grass strata must have ≥ 10 percent cover (including cryptograms).
Topo Moisture	3	dry, well drained ridgetop or prow.
	4	dry mid-slope.
	5	mesic toe slope.
	7	moist basin.

FIXED AREA ECOLOGY PLOT
DATA DICTIONARY - ID CDC (06/1996)

FIELD	VALUE	DESCRIPTION	SYEN TUFF	Syenite Tuff
Aspect	RANGE	0 - 360; Declination-corrected azimuth of slope aspect to nearest degree		
Bedrock Comp			Bedrock Origin	
	ANDE	Andesite	CO	Conglomerate
	ARGI	Argillite	IG	Igneous
	BASA	Basalt	ME	Metamorphic
	BREC	Breccia	MI	Mixed
	CHAL	Chalk	MS	Metasedimentary
	COAL	Coal	PY	Pyroclastic
	CONG	Conglomerate	SE	Sedimentary
	DACI	Dacite	UN	Unconsolidated
	DAIR	Dairite		
	DOLO	Dolomite	Bdrk	RANGE Outcrop; 0 >100; % ground cover
	DIOR	Diorite	Bldr	RANGE Boulder; 0 >100; % ground cover
	EJEC	Ejecta	Bave	RANGE Basal veg.; 0 >100; % ground cover
	GABB	Gabbro	Cbl	RANGE Cobble (3-5.9); 0 >100; % ground cover
	GLAS	Glass		
	GLAU	Glauconite	E Hor	RANGE 0 >100; % Slope vertical angle between plot center and landform east
	GNEI	Gneiss		
	GRAN	Granite		
	GYPS	Gypsum		
	HALI	Halite	Elevation	RANGE 0 >25000; Elevation of plot in feet
	HORN	Hornfels		
	LATI	Latite	Fuel Cls	00 Unable to assess
	LIME	Limestone		01 Fine, porous, and continuous herbaceous fuels of grasslands savannas grass-tun.
	MARB	Marble		02 Fine herbaceous fuel with some litter and dead stemwood with open shrub and forest
	MARL	Marl		03 Tall, thick graminoid-dominated stands
	MONZ	Monzonite		04 Forest or shrub stands with continuous overstory with much flammable woody material
	OBSI	Obsidian		05 Forest or shrub stands with light surface fuels and slightly flammable shrub and wood
	PAHO	Pahoehoe		06 Open forest with shrubs or shrublands that have moderately flammable woody material
	PHYL	Phyllite		07 Closed forest stands and understory shrub layer with flammable material in both
	PUMI	Pumice		08 Closed conifer stands with low flammability and a compact litter layer
	QUAR	Quartzite		09 Closed stands of ponderosa pine with thick litter layer
	RHYO	Rhyolite		
	SAND	Sandstone		
	SCHI	Schist		
	SCOR	Scoria		
	SERP	Serpentinite, Serpentine		
	SHAL	Shale		
	SILT	Siltstone		
	SLAT	Slate		

	10	Closed forest types with heavy fuel loading of down woody material		KA	Kame
	11	Light logging slash, varying in continuity		KE	Kettle
	12	Moderate, continuous logging slash		KL	Knoll
	13	Heavy, continuous logging slash		LD	Landslide
				LE	Levee (natural)
Geo Process	BE	Beach, marine		MR	Moraine
	DE	Depression		MS	Mountainside
	EO	Eolian		NU	Nunatak
	ER	Erosional		OP	Outwash plain
	FL	Fluvial		OT	outwash terrace
	GL	Glacial		OX	Oxbow
	LA	Lacustrine		PE	Pediment
	MM	Mass movement		RI	Ridge
	PG	Periglacial		SB	Structural bench
	SL	Slope		SC	Stream channel
	SO	Solution		SL	Backwater slough
	TV	Tectonic structural volcanic		SR	Stream bar
	WA	Water		ST	Stream breaks
	WE	Wetland		SW	Swale
Grvl				TR	Trough
				VC	Volcanic cone
	RANGE	Gravel (1/16-3); 0 > 100; % ground cover		VF	Valley floor
				VS	Valley side
Landform	AF	Alluvial fan			
	AM	Abandoned meander	Landform Mod	IT	Intermediate (100-300 ft)
	AV	Avalanche track		N	Not applicable
	BC	Basin floor		NW	Narrow (<100 ft)
	BF	Block field		WI	Wide (>300 ft)
	BS	Structural breaks		X	Unable to assess
	BU	Butte			
	CA	Canyon	Landscape	BA	Badlands
	CD	Caldera		BK	Breaks
	CQ	Cirque		DE	Delta
	DN	Drainageway		FH	Foothills
	DR	Drumlin		HI	Hills
	DS	Dipslope		IB	Intermontane basin
	DU	Dune		LP	Lacustrine plain
	DW	Draw		MG	Glaciated mountains
	ES	Escarpment		MO	Mountains
	FN	Fan		PL	Plain
	FP	Floodplain		PT	Plateau
	FS	Fault-line scarp		TP	Till plain
	FT	Fluvial terrace		VA	Valley
	GB	Graben			
	HO	Horst	Landscape Mod	CS	Coastal
	HS	Hillside		DE	Delta
	HU	Hummock		DI	Dissected
	HW	Headwall		GF	Glaciofluvial

	GL	Glaciated
	HI	High
	IN	Inter-montane
	LA	Lake
	LC	Lacustrine
	LE	Level
	LV	Lava
	MA	Marine
	MO	Mountain
	RI	River
	TI	Till
	UN	Undulating
	VO	Volcanic
Lichen	RANGE	Lichen; 0 >100; % ground cover
Litter	RANGE	Litter (<1/4) and Wood (>1/4); 0 >100; % ground cover
Moss	RANGE	Moss; 0 >100; % ground cover
Mh, Mv	BR	Broken
	CC	Concave
	CV	Convex
	FL	Flat
	LL	Linear or planar
	PA	Patterned
	PL	Plane
	ST	Straight
	UN	Undulating
N Hor	RANGE	0 >100; % Slope vertical angle between plot center and landform north
P Posit	S Posit	AF-LS Alluvial Fan-Lower Slope
	AF-MS	Alluvial Fan-Mid Slope
	AF-US	Alluvial Fan-Upper Slope
	BE-NA	Bench-Narrow (<100' wide)
	BE-WI	Bench-Wide (> or = 100' wide)
	DU-BS	Dune-Backslope
	DU-DE	Dune-Depression
	DU-FS	Dune-Footslope
	DU-SH	Dune-Shoulder
	DU-SS	Dune-Short Slope
	DU-TS	Dune-Toeslope
	FP-LS	Fan Piedmont-Lower Slope
	FP-MS	Fan Piedmont-Mid Slope
	FP-US	Fan Piedmont-Upper Slope
	HS-BS	Hill Slope-Backslope

	HS-DE	Hill Slope-Depression
	HS-DR	Hill Slope-Drainageway
	HS-FS	Hill Slope-Footslope
	HS-SH	Hill Slope-Shoulder
	HS-SS	Hill Slope-Short Slope (<100')
	HS-SU	Hill Slope-Summit
	HS-TS	Hill Slope-Toeslope
	HU-HS	Hummock-Hummock Summit
	HU-MS	Hummock-Mid Slope
	MS-BS	Mountain Slope-Backslope
	MS-DE	Mountain Slope-Depression
	MS-DR	Mountain Slope-Drainageway
	MS-FS	Mountain Slope-Footslope
	MS-SH	Mountain Slope-Shoulder
	MS-SS	Mountain Slope-Short Slope (<100')
	MS-SU	Mountain Slope-Summit
	MS-TS	Mountain Slope-Toeslope
	MV-AM	Moderate Valley (100-300')-Abandoned Meander
	MV-BS	Moderate Valley (100-300')-Backwater Slough
	MV-DR	Moderate Valley (100-300')-Drainageway
	MV-FP	Moderate Valley (100-300')-Flood Plain
	MV-OX	Moderate Valley (100-300')-Oxbow
	MV-SB	Moderate Valley (100-300')-Stream Bar
	MV-SC	Moderate Valley (100-300')-Stream Channel
	MV-TE	Moderate Valley (100-300')-Terrace
	NV-FA	Narrow Valley (<100')-Fan
	NV-LE	Narrow Valley (<100')-Levee (natural)
	NV-SB	Narrow Valley (<100')-Stream Bar
	NV-SC	Narrow Valley (<100')-Stream Channel
	NV-TE	Narrow Valley (<100')-Terrace
	RI-NA	Ridge-Narrow
	RI-WI	Ridge-Wide
	WV-AM	Wide Valley (>300')-Abandoned Meander
	WV-BS	Wide Valley (>300')-Backwater Slough
	WV-FP	Wide Valley (>300')-Flood Plain
	WV-OX	Wide Valley (>300')-Oxbow
	WV-SB	Wide Valley (>300')-Stream Bar
	WV-SC	Wide Valley (>300')-Stream Channel
	WV-TE	Wide Valley (>300')-Terrace
	WV-TS	Wide Valley (>300')-Toeslope
PM Origin	AL	Alluvium
	BS	Beach sand
	CI	Cinders
	CM	Coprogeic material
	CO	Colluvium
	CR	Crypturbate
	DE	Diatomaceous earth

	DI	Diamictin		HERB	Herbaceous
	DP	Deposits		LACU	Lacustrine
	EO	Eolim		LODG	Lodgement
	GD	Glacial drift		MARI	Marine
	LO	Loess		MELT	Melt
	MA	Marl		MK	Mucky
	OR	Organic		MOSS	Mossy
	OU	Outwash		PF	Non-consolidated permafrost
	PE	Pedisediment		PT	Peaty
	RE	Residuum		RB	Rubbly
	TE	Tephra		SLOP	Slope
	TI	Till		SLUM	Slump
	VA	Volcanic ash		ST	Stony
	VB	Volcanic bombs		STV	Very stony
				STX	Extremely stony
PM Origin Mod	ABLA	Ablation		SUPR	Supraglacial
	ACID	Acidic		UNSP	Unspecified
	ANDE	Andesitic		VASI	Valley side
	BASA	Basal		WOOD	Woody
	BASI	Basic			
	BASL	Basaltic	S Hor	RANGE	0 >100; % Slope vertical angle between plot center and landform south
	BY	Bouldery			
	BYV	Very bouldery			
	BYX	Extremely bouldery	Slope	RANGE	Slope; 0 >360; Inclination of the surface of the soil from the horizontal
	CALC	Calcareous			
	CB	Cobbly			
	CBA	Angular cobbly	Soil	RANGE	Soil (<1/16); % ground cover
	CBV	Very cobbly			
	CBX	Extremely cobbly	Strn	RANGE	Stone; 0 >100; % ground cover
	CN	Channery			
	CNV	Very channery	W Hor	RANGE	0 >100; % Slope vertical angle between plot center and landform west
	CNX	Extremely channery			
	COLL	Colluvial			
	ESTU	Estuarine	Water	RANGE	Water; 0 >100; % ground cover
	FL	Flaggy			
	FLOW	Flow			
	FLV	Very flaggy			
	FLX	Extremely flaggy			
	GLFL	Glacio fluid			
	GLLA	Glacio lacustrine			
	GLMA	Glacio marine			
	GR	Gravelly			
	GRAS	Grassy			
	GRC	Coarse gravelly			
	GRF	Fine gravelly			
	GRM	Medium gravelly			
	GRV	Very gravelly			
	GRX	Extremely gravelly			

Appendix 2. Upland vascular plant species list for the Pioneer Mountain Ranch, June - September, 2001.

Plant species are listed alphabetically by life form group with the estimated abundance within general terrestrial habitats. Nomenclature follows Cronquist et al. (1972 - 1997). The nomenclature of *Artemisia arbuscula* follows Winward (1980). The nomenclature for species that are not described by Cronquist et al. (1972 - 1997) follows Hitchcock and Cronquist (1973).

Species	Common Name
Trees	
<i>Abies lasiocarpa</i>	subalpine fir
<i>Pinus albicaulis</i>	whitebark pine
<i>Pinus flexilis</i>	limber pine
<i>Populus tremuloides</i>	quaking aspen
<i>Populus trichocarpa</i>	black cottonwood
<i>Pseudotsuga menziesii</i>	Douglas-fir
Shrubs	
<i>Alnus incana</i>	thinleaf alder
<i>Amelanchier alnifolia</i>	serviceberry
<i>Amelanchier utahensis</i>	Utah serviceberry
<i>Artemisia arbuscula arbuscula</i>	low sagebrush
<i>Artemisia arbuscula thermopola</i>	cleftleaf sagebrush
<i>Artemisia spiciformis</i>	snowfield sagebrush
<i>Artemisia tridentata tridentata</i>	basin big sagebrush
<i>Artemisia tridentata vaseyana</i>	mountain big sagebrush
<i>Artemisia tridentata wyomingensis</i>	Wyoming big sagebrush
<i>Berberis repens</i>	Oregon grape
<i>Betula glandulosa glandulosa</i>	bog birch
<i>Ceanothus velutinus</i>	shiny-leaf ceanothus
<i>Chamaebatiaria millifolium</i>	fern-bush
<i>Chrysothamnus nauseosus</i>	green rabbit-brush
<i>Chrysothamnus viscidiflorus</i>	green rabbit-brush
<i>Haplopappus suffruticosus</i>	shrubby goldenweed
<i>Philadelphus lewisii</i>	mock orange
<i>Prunus virginiana</i>	chokecherry
<i>Purshia tridentata</i>	antelope bitterbrush
<i>Ribes cereum</i>	squaw currant
<i>Ribes montigenum</i>	mountain gooseberry
<i>Ribes hudsonianum</i>	stinking currant
<i>Ribes viscosissimum</i>	sticky currant
<i>Rosa woodsii</i>	Wood's rose
<i>Rubus idaeus</i>	red raspberry
<i>Salix scouleriana</i>	Scouler willow
<i>Sambucus cerulea</i>	blue elderberry
<i>Shepherdia canadensis</i>	buffaloberry
<i>Symphoricarpos oreophilus</i>	mountain snowberry
Herbs	
<i>Achillea millefolium</i>	yarrow
<i>Agastache urticifolia</i>	nettle-leaf horsemint
<i>Agoseris aurantiaca</i>	orange agoseris
<i>Agoseris grandiflora</i>	large flowered agoseris
<i>Allium acuminatum</i>	tapertipped onion

<i>Allium</i> spp.	onion species
<i>Amsinckia retrorsa</i>	rigid fiddleneck
<i>Angelica arguta</i>	Lyall's angelica
<i>Antennaria alpina</i>	alpine pussy-toes
<i>Antennaria dimorpha</i>	low pussy-toes
<i>Antennaria microphylla</i>	rosy pussytoes
<i>Apocynum sibiricum</i>	clasping-leaved dogbane
<i>Aquilegia formosa</i>	red columbine
<i>Arabis holboellii</i>	Holboell's rockcress
<i>Arabis microphylla</i>	little leaf rockcress
<i>Arabis suffrutescens</i>	woody rockcress
<i>Arctium minus</i>	common burdock
<i>Arenaria aculeata</i>	needleleaf sandwort
<i>Arenaria capillaris</i>	thread-leaved sandwort
<i>Arenaria congesta</i>	capitate sandwort
<i>Arenaria kingii</i>	King's sandwort
<i>Arnica chamissonis</i>	leafy arnica
<i>Arnica cordifolia</i>	heart-leaved arnica
<i>Arnica latifolia</i>	tall arnica
<i>Arnica sororia</i>	twin arnica
<i>Artemisia ludoviciana incompta</i>	western mugwort
<i>Artemisia ludoviciana latiloba</i>	Louisiana mugwort
<i>Asperugo procumbens</i>	madwort
<i>Aster campestris</i>	western meadow aster
<i>Aster integrifolius</i>	thick stemmed aster
<i>Aster perelegans</i>	elegant aster
<i>Astragalus purshii</i>	Pursh's milk-vetch
<i>Balsamorhiza sagittata</i>	arrowleaf balsamroot
<i>Barbarea orthoceras</i>	American wintercress
<i>Calochortus eurycarpus</i>	wide-fruit mariposa
<i>Calochortus macrocarpus</i>	sagebrush mariposa
<i>Calochortus nuttallii</i>	sego-lily
<i>Castilleja flava rustica</i>	yellow paintbrush
<i>Castilleja miniata</i>	scarlet paintbrush
<i>Castilleja pallescens</i>	palish paintbrush
<i>Centaurea diffusa</i>	diffuse knapweed
<i>Centaurea maculosa</i>	spotted knapweed
<i>Cerastium viscosum</i>	sticky chickweed
<i>Chaenactis douglasii</i>	hoary chaenactis
<i>Chenopodium album</i>	lambsquarter
<i>Chenopodium fremontii</i>	Fremont's goosefoot
<i>Cichorium intybus</i>	wild succory
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium canovirens</i>	gray-green thistle
<i>Clematis hirsutissima</i>	Douglas' clematis
<i>Collinsia parviflora</i>	small-flowered blue-eyed Mary
<i>Collomia grandiflora</i>	grand collomia
<i>Collomia linearis</i>	narrow-leaf collomia
<i>Collomia tinctoria</i>	yellow-staining collomia
<i>Cordylanthus capitatus</i>	clustered birdbeak
<i>Cordylanthus ramosus</i>	bushy birdbeak
<i>Crepis acuminata</i>	long-leaved hawksbeard
<i>Crepis modocensis</i>	low hawksbeard
<i>Crepis occidentalis</i>	western hawksbeard

<i>Cryptantha torreyana</i>	Torrey's cryptantha
<i>Cryptantha watsonii</i>	Watson's cryptantha
<i>Cuscuta occidentalis</i>	wester dodder
<i>Cymopterus terebinthinus foeniculaceus</i>	turpentine cymopterus
<i>Delphinium occidentale</i>	western larkspur
<i>Delphinium spp.</i>	larkspur species
<i>Descurainia richardsonii</i>	mountain tansymustard
<i>Descurainia pinnata</i>	leafy tansymustard
<i>Descurainia sophia</i>	flixweed
<i>Draba sp.</i>	whitlow grass
<i>Epilobium angustifolium</i>	fireweed
<i>Epilobium paniculatum</i>	parched fireweed
<i>Erigeron bloomeri</i>	scabland fleebane
<i>Erigeron linearis</i>	desert yellow daisy
<i>Erigeron pumilus</i>	shaggy fleabane
<i>Eriogonum caespitosum</i>	mat buckwheat
<i>Eriogonum capistratum capistratum</i>	hidden buckwheat
<i>Eriogonum heracleoides</i>	Wyeth buckwheat
<i>Eriogonum heracleoides minus</i>	Wyeth buckwheat
<i>Eriogonum microthecum</i>	slenderbush buckwheat
<i>Eriogonum ovalifolium</i>	cushion buckwheat
<i>Eriogonum umbellatum</i>	sulfur flower
<i>Eriogonum umbellatum subalpinum</i>	sulfur flower
<i>Eriophyllum lanatum</i>	woolly sunflower
<i>Frasera speciosa</i>	giant frasera
<i>Fritillaria atropurpurea</i>	checker lily
<i>Fritillaria pudica</i>	yellow bell
<i>Galium aparine echinospermum</i>	cleavers
<i>Galium multiflorum</i>	shrubby bedstraw
<i>Galium triflorum</i>	bedstraw
<i>Gayophytum diffusum</i>	spreading groundsmoke
<i>Geranium viscosissimum</i>	sticky geranium
<i>Geum macrophyllum</i>	Oregon avens
<i>Geum triflorum</i>	old man's whiskers
<i>Gilia aggregata</i>	scarlet gilia
<i>Grindelia nana</i>	low gumweed
<i>Hackelia micrantha</i>	blue stickseed
<i>Haplopappus acaulis</i>	stemless goldenweed
<i>Helianthus nuttallii</i>	Nuttall's helianthel
<i>Helianthella uniflora</i>	Rocky Mountain helianthel
<i>Heracleum lanatum</i>	cow parsnip
<i>Heuchera cylindrica</i>	roundleaf alumroot
<i>Heuchera parvifolia</i>	common alumroot
<i>Hieracium albertinum</i>	western hawkweed
<i>Hydrophyllum capitatum</i>	ballhead waterleaf
<i>Iliamna rivularis rivularis</i>	streambank globmellow
<i>Iva axillaris</i>	deep root
<i>Lactuca serriola</i>	prickly lettuce
<i>Lappula redowskii</i>	western stickseed
<i>Lepidium virginicum</i>	tall peppergrass
<i>Lewisia rediviva</i>	bitterroot
<i>Linanthus septentrionalis</i>	northern linanthus
<i>Lithophragma parviflora</i>	small flowered prairie star
<i>Lithospermum ruderales</i>	Columbia pucoon

<i>Lomatium dissectum</i>	fern-leaved lomatium
<i>Lomatium triternatum</i>	nine-leaf lomatium
<i>Lupinus argenteus</i>	silvery lupine
<i>Lupinus argenteus utahensis</i>	silvery lupine
<i>Lupinus sericeus sericeus</i>	silky lupine
<i>Machaeranthera canescens sessiliflora</i>	hoary aster
<i>Madia gracilis</i>	gum-weed
<i>Malva neglecta</i>	poverty weed
<i>Medicago sativa</i>	alfalfa
<i>Mentha arvensis</i>	cornmint
<i>Mentzelia albicaulis</i>	white-stemmed mentzelia
<i>Mentzelia dispersa</i>	bushy mentzelia
<i>Mertensia ciliata</i>	broad-leaf bluebells
<i>Mertensia oblongifolia</i>	leafy bluebells
<i>Microseris nutans</i>	nodding microseris
<i>Microseris gracilis</i>	microseris
<i>Mimulus guttatus</i>	yellow monkey-flower
<i>Mimulus lewisii</i>	purple monkey-flower
<i>Mimulus nanus</i>	short monkey-flower
<i>Montia chamissoi</i>	miner's lettuce
<i>Navarretia breweri</i>	Brewer's navarretia
<i>Navarretia intertexta propinqua</i>	needle-leaf navarretia
<i>Nicotiana attenuata</i>	coyote tobacco
<i>Onopordum acanthium</i>	Scotch thistle
<i>Opuntia polyacantha</i>	starvation cholla
<i>Orobanche fasciculata</i>	clustered broomrape
<i>Osmorhiza chilensis</i>	mountain sweet cicely
<i>Osmorhiza occidentalis</i>	western sweet-cicely
<i>Oxyria digyna</i>	mountain sorrel
<i>Oxytropis lagopus</i>	rabbit-foot crazyweed
<i>Paeonia brownii</i>	Brown's peony
<i>Penstemon attenuatus</i>	taper-leaved penstemon
<i>Penstemon attenuatus attenuatus</i>	sulfur penstemon
<i>Penstemon deustus</i>	hot-rock penstemon
<i>Penstemon humilis</i>	lowly penstemon
<i>Phacelia hastata</i>	whiteleaf phacelia
<i>Phacelia heterophylla</i>	varileaf phacelia
<i>Phacelia sericea</i>	silky phacelia
<i>Phlox diffusa</i>	spreading phlox
<i>Phlox hoodii</i>	Hood's phlox
<i>Phlox longifolia</i>	long-leaf phlox
<i>Phlox pulvinata</i>	cushion phlox
<i>Phoenicaulis cheiranthoides</i>	daggerpod
<i>Plantago major</i>	nippleseed plantain
<i>Polygonum douglasii douglasii</i>	Douglas' knotweed
<i>Potentilla diversifolia</i>	diverse leaved cinquefoil
<i>Potentilla glandulosa nevadensis</i>	sticky cinquefoil
<i>Potentilla gracilis elmeri</i>	Elmer's cinquefoil
<i>Ranunculus andersonii</i>	pink buttercup
<i>Rumex crispus</i>	curly dock
<i>Rumex salicifolius triangulivalvis</i>	willow dock
<i>Sedum lanceolatum</i>	lance-leaved stonecrop
<i>Senecio canus</i>	wooly groundsel
<i>Senecio integerrimus</i>	western groundsel

Senecio serra serra
Senecio streptanthifolius
Sibbaldia procumbens
Sidalcea oregana
Silene douglasii douglasii
Silene menziesii
Sisymbrium altissimum
Smilacina racemosa
Smilacina stellata
Sonchus arvensis
Spraguea umbellata
Stellaria longipes
Taraxacum officinale
Tetradymia canescens
Thalictrum venulosum
Thlaspi arvense
Tragopogon dubius
Trifolium repens
Urtica dioica
Valeriana acutiloba pubicarpa
Veratrum californicum
Verbascum thapsus
Viola purpurea
Wyethia amplexicaulis
Zigadenus paniculatus
Zigadenus venenosus

butterweed groundsel
 Rocky Mtn. butterweed
 creeping sibbaldia
 Oregon checker-mallow
 Douglas' silene
 Menzies' silene
 tumbling mustard
 false Solomon's seal
 false Solomon's seal
 perennial sow-thistle
 pussypaws
 longstalk starwort
 common dandelion
 spineless horse-brush
 veiny meadowrue
 field pennycress
 common salsify
 white clover
 stinging nettles
 downy-fruit valerian
 California false hellebor
 flannel mullein
 goosefoot violet
 mule's ear
 panicked death-camas
 death camas

Grasses, sedges and rushes

Agropyron intermedium
Agropyron repens
Agropyron spicatum
Agropyron trachycaulum trachycaulum
Agrostis scabra
Bromus carinatus
Bromus japonicus
Bromus tectorum
Calamagrostis rubescens
Carex aquatilis
Carex douglasii
Carex geyeri
Carex hoodii
Carex lanuginosa
Carex nebraskensis
Carex rossii
Carex utriculata
Dactylis glomerata
Danthonia unispicata
Deschampsia elongata
Elymus cinereus
Festuca idahoensis
Hordeum brachyantherum
Juncus balticus
Juncus ensifolius
Koeleria cristata

intermediate wheatgrass
 quack grass
 bluebunch wheatgrass
 slender wheatgrass
 winter bentgrass
 California brome
 Japanese brome
 cheat grass
 pinegrass
 water sedge
 Douglas' sedge
 elk sedge
 Hood's sedge
 woolly sedge
 Nebraska sedge
 Ross sedge
 beaked sedge
 orchard grass
 onespike oatgrass
 slender hairgrass
 giant wildrye
 Idaho fescue
 meadow barley
 Baltic rush
 dagger-leaf rush
 prairie junegrass

Leucopoa kingii
Melica bulbosa
Phleum alpinum
Phleum pratense
Poa ampla
Poa bulbosa
Poa cusickii
Poa nevadensis
Poa pratensis
Poa secunda
Sitanion hystrix
Stipa columbiana nelsoni
Stipa occidentalis
Stipa thurberiana
Trisetum spicatum

Ferns and fern allies

Equisetum hyemale
Woodsia oregana

spike fescue
onion grass
alpine timothy
common timothy
alkali bluegrass
bulbous brome
Cusick's bluegrass
Nevada bluegrass
Kentucky bluegrass
Sandberg's bluegrass
squirreltail bottlebrush
Nelson's needlegrass
western needlegrass
Thurber's needlegrass
spike trisetum

common scouring-rush
woodsia

Appendix 3. Vertebrate species list for Pioneer Mountain Ranch, June to September, 2001.

Vertebrate species observed (indicated by an asterisk [*]) or expected in the study area are listed by class.

Amphibians

<i>Ambystoma macrodactylum</i>	Long-toed salamander
<i>Bufo boreas</i>	Western toad
<i>Hyla regilla</i>	Pacific treefrog
<i>Rana pipiens</i>	Northern leopard frog
<i>Rana pretiosa</i>	Spotted frog
<i>Scaphiopus intermontanus</i>	Great Basin spadefoot

Birds

<i>Accipiter cooperii</i>	Cooper's hawk *
<i>Accipiter gentilis</i>	Northern goshawk *
<i>Accipiter striatus</i>	Sharp-shinned hawk *
<i>Actitis macularia</i>	Spotted sandpiper
<i>Aegolius acadicus</i>	Northern saw-whet owl
<i>Aeronautes saxatalis</i>	White-throated swift
<i>Agelaius phoeniceus</i>	Red-winged blackbird *
<i>Alectoris chukar</i>	Chukar *
<i>Ammodramus savannarum</i>	Grasshopper sparrow
<i>Amphispiza belli</i>	Sage sparrow *
<i>Anas acuta</i>	Northern pintail
<i>Anas americana</i>	American wigeon *
<i>Anas clypeata</i>	Northern shoveler *
<i>Anas cyanoptera</i>	Cinnamon teal *
<i>Anas platyrhynchos</i>	Mallard *
<i>Anas strepera</i>	Gadwall
<i>Aquila chrysaetos</i>	Golden eagle *
<i>Archilochus alexandri</i>	Black-chinned hummingbird
<i>Ardea herodias</i>	Great blue heron *
<i>Asio flammeus</i>	Short-eared owl *
<i>Asio otus</i>	Long-eared owl *
<i>Aythya affinis</i>	Lesser scaup
<i>Aythya americana</i>	Redhead
<i>Bombycilla cedrorum</i>	Cedar waxwing
<i>Bonasa umbellus</i>	Ruffed grouse
<i>Botaurus lentiginosus</i>	American bittern
<i>Branta canadensis</i>	Canada goose *
<i>Bubo virginianus</i>	Great horned owl *
<i>Buteo jamaicensis</i>	Red-tailed hawk *
<i>Buteo swainsoni</i>	Swainson's hawk *
<i>Carduelis pinus</i>	Pine siskin
<i>Carduelis tristis</i>	American goldfinch
<i>Carpodacus cassinii</i>	Cassin's finch
<i>Carpodacus mexicanus</i>	House finch
<i>Cathartes aura</i>	Turkey vulture *
<i>Catharus fuscescens</i>	Veery
<i>Catharus ustulatus</i>	Swainson's thrush
<i>Centrocercus urophasianus</i>	Sage grouse *
<i>Ceryle alcyon</i>	Belted kingfisher *
<i>Charadrius vociferus</i>	Killdeer *

Chondestes grammacus
Chordeiles minor
Circus cyaneus
Coccothraustes vespertinus
Colaptes auratus
Contopus borealis
Contopus sordidulus
Corvus brachyrhynchos
Corvus corax
Dendroica coronata
Dendroica petechia
Dumetella carolinensis
Empidonax oberholseri
Empidonax traillii
Eremophila alpestris
Euphagus cyanocephalus
Falco mexicanus
Falco sparverius
Fulica americana
Gallinago gallinago
Hirundo pyrrhonota
Hirundo rustica
Icteria virens
Icterus parisorum
Junco hyemalis
Lanius ludovicianus
Loxia curvirostra
Melanerpes lewis
Melospiza lincolnii
Melospiza melodia
Molothrus ater
Myadestes townsendi
Nucifraga columbiana
Oporornis tolmiei
Oreoscoptes montanus
Otus flammeolus
Otus kennicottii
Parus atricapillus
Parus gambeli
Passerculus sandwichensis
Passerella iliaca
Passerina amoena
Perisoreus canadensis
Perdix perdix
Phalaenoptilus nuttallii
Phasianus colchicus
Pheucticus melanocephalus
Pica pica
Picoides pubescens
Picoides villosus
Pipilo chlorurus
Pipilo erythrophthalmus
Piranga ludoviciana
Podilymbus podiceps

Lark sparrow
 Common nighthawk *
 Northern harrier *
 Evening grosbeak
 Northern flicker
 Olive-sided flycatcher
 Western wood-pewee
 American crow *
 Common raven *
 Yellow-rumped warbler
 Yellow warbler
 Gray catbird
 Dusky flycatcher
 Willow flycatcher
 Horned lark
 Brewer's blackbird *
 Prairie falcon
 American kestrel *
 American coot *
 Common snipe
 Cliff swallow *
 Barn swallow *
 Yellow-breasted chat
 Scott's oriole
 Dark-eyed junco
 Loggerhead shrike *
 Red crossbill
 Lewis' woodpecker *
 Lincoln's sparrow
 Song sparrow
 Brown-headed cowbird *
 Townsend's solitaire *
 Clark's nutcracker *
 MacGillivray's warbler
 Sage thrasher
 Flammulated owl
 Western screech-owl
 Black-capped chickadee *
 Mountain chickadee
 Savannah sparrow
 Fox sparrow
 Lazuli bunting
 Gray jay *
 Gray partridge
 Common poorwill *
 Ring-necked pheasant *
 Black-headed grosbeak
 Black-billed magpie *
 Downy woodpecker
 Hairy woodpecker *
 Green-tailed towhee
 Rufous-sided towhee
 Western tanager
 Pied-billed grebe

Poocetes gramineus
Regulus calendula
Regulus satrapa
Riparia riparia
Salpinctes obsoletus
Sayornis saya
Selasphorus platycercus
Setophaga ruticilla
Sialia currucoides
Sphyrapicus nuchalis
Spizella breweri
Spizella passerina
Stelgidopteryx serripennis
Sturnella neglecta
Tachycineta thalassina
Troglodytes aedon
Turdus migratorius
Tyrannus tyrannus
Tyrannus verticalis
Tyto alba
Vermivora celata
Vermivora ruficapilla
Vireo gilvus
Vireo solitarius
Zenaidura macroura

Mammals

Alces alces
Antilocapra americana
Canis latrans
Castor canadensis
Cervus elaphus
Dipodomys ordii
Eptesicus fuscus
Erethizon dorsatum
Felis concolor
Felis rufus
Glaucomys sabrinus
Lasionycteris noctivagans
Lasiurus cinereus
Lemmings curtatus
Lepus californicus
Lepus townsendii
Lutra canadensis
Marmota flaviventris
Mephitis mephitis
Microtus longicaudus
Microtus montanus
Microtus pennsylvanicus
Mustela erminea
Mustela frenata
Mustela vison
Myotis evotis
Myotis lucifugus

Vesper sparrow
 Ruby-crowned kinglet
 Golden-crowned kinglet
 Bank swallow
 Rock wren *
 Say's phoebe
 Broad-tailed hummingbird
 American redstart
 Mountain bluebird *
 Red-naped sapsucker
 Brewer's sparrow
 Chipping sparrow
 Northern rough-winged swallow
 Western meadowlark *
 Violet-green swallow
 House wren
 American robin *
 Eastern kingbird
 Western kingbird
 Common barn-owl *
 Orange-crowned warbler
 Nashville warbler
 Warbling vireo
 Solitary vireo
 Mourning dove *

Moose *
 Pronghorn *
 Coyote *
 Beaver *
 Elk *
 Ord's kangaroo rat *
 Big brown bat
 Porcupine *
 Mountain lion *
 Bobcat *
 Northern flying squirrel
 Silver-haired bat
 Hoary bat
 Sagebrush vole
 Black-tailed jackrabbit *
 White-tailed jackrabbit *
 River otter *
 Yellow-bellied marmot *
 Striped skunk
 Long-tailed vole
 Montane vole
 Meadow vole
 Ermine
 Long-tailed weasel *
 Mink
 Long-eared myotis
 Little brown myotis

Myotis volans
Myotis yumanensis
Neotoma cinerea
Ochotona princeps
Odocoileus hemionus
Ondatra zibethicus
Onychomys leucogaster
Perognathus parvus
Peromyscus crinitus
Peromyscus maniculatus
Plecotus townsendii
Procyon lotor
Reithrodontomys megalotis
Sorex merriami
Sorex palustris
Sorex vagrans
Spermophilus columbianus
Spermophilus elegans
Spermophilus lateralis
Spermophilus townsendii
Spilogale gracilis
Sylvilagus nuttallii
Tamias minimus
Tamiasciurus hudsonicus
Tamias amoenus
Taxidea taxus
Thomomys talpoides
Ursus americanus
Vulpes vulpes
Zapus princeps

Reptiles

Charina bottae
Coluber constrictor
Crotalus viridis
Eumeces skiltonianus
Phrynosoma douglassii
Pituophis melanoleucus
Sceloporus graciosus
Thamnophis elegans
Thamnophis sirtalis

Long-legged myotis
 Yuma myotis
 Bushy-tailed woodrat
 Pika *
 Mule deer *
 Muskrat
 Northern grasshopper mouse *
 Great Basin pocket mouse
 Canyon mouse
 Deer mouse *
 Townsend's big-eared bat
 Raccoon *
 Western harvest mouse
 Merriam's shrew
 Water shrew
 Vagrant shrew
 Columbian ground squirrel
 Wyoming ground squirrel
 Golden-mantled ground squirrel
 Townsend's ground squirrel
 Western spotted skunk
 Nuttall's cottontail
 Least chipmunk
 Red squirrel
 Yellow-pine chipmunk
 Badger *
 Northern pocket gopher *
 Black bear *
 Red fox *
 Western jumping mouse

Rubber boa
 Racer
 Western rattlesnake *
 Western skink
 Short-horned lizard
 Gopher snake *
 Sagebrush lizard
 Western terrestrial garter snake
 Common garter snake